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REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1868.

> "Tum mihi Naturæ Libeat perdiscere mores:
> Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE.
1869.

PREFACE.

ONE of the soundest and most encouraging points in the progress of our Society, is the extent to which donations continue to flow in to the Museum. On a later page a complete list of such contributions during the past half-year will be found. It will be enough here to remark with pleasure on the kind interest which has been displayed towards the Society by some of our neighbours in the town of Marlborough. Mr. Baverstock, in August last, presented us with an enlarged photograph of the President, of remarkable excellence and fidelity. We have also received presents from Mr. Parker, Mr. Hawkins, Mr. Gauntlett, and Mr. Chivers, the latter giving a curious silver plate, of Chinese workmanship, probably an honorary badge conferred on a soldier by the Mandarin of his district.* Our special thanks are also due to the following donors beyond the limits of the Society, Rev. A. Butler (late Head Master of Haileybury), Rev. C. Soames, Dr. Walker, Mr. Dixon, and Dr. C. W. Elwes, who has kindly sent several contributions of interest.

Notices of all kinds that the season and the weather have permitted have been quite up to the average of vigour and interest, and the attendance at the fortnightly meetings, taking the half-year throughout, has been satisfactory.

It has been brought as a charge against our proceedings that the Report contains more papers by outsiders or by Hon. Members, than by actual members of the Society. In reply to this we may observe, that actual members have borne, and bear, their full share of work in this department. It scarcely requires explanation, however, that for the purposes of our report the most interesting and comprehensive papers have to be selected, and that these naturally come, in many cases, from the maturer hands of those who are kind enough to assist us from outside or from the honorary list.

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* This plate was sent for explanation to Rev. G. E. Moule, B.A., of Ningpo, in China, at present making a stay in England, who kindly sent a full account of the inscription.

Remarkable vigour has been shewn throughout the past half-year by the Geological Section. During the fine summer weather at its commencement, Mr. Dixon kindly undertook two interesting excursions, one to Oare Hill, from whence the denudation of Pewsey Vale and some tertiary patches were pointed out, and the other to the Valley of Stones. F. Giles is now the head of this Section, as G. E. Manisty has undertaken the duties of Secretary. The loss of E. im Thurn has been severely felt in the Ornithological Section, where his services had been extremely useful.

This is the proper place to call attention to the fact that the honorary list, originally confined to Masters, is now open to any Old Marlburians who feel inclined to join it on the usual terms. It is hoped that we thus may secure the co-operation of some former members of the School who left before the Society had come into play.

The President, besides his weekly lectures on Botany, has been lecturing certain Forms in the Upper School on Botany and Physiology. In connection with the latter lecture, which has been received with very marked interest, the President is also forming a Physiological Museum adjoining Mr. Macdonald's Class Room in the Old House. Contributions to this collection would be gladly received by Mr. Preston. We are sure that this kind of movement will be hailed with satisfaction by anyone who is interested in the sound progress of Natural knowledge amongst us.

LIST OF MEMBERS.

President:

Rev. T. A. Preston.

Secretary:

G. E. Manisty.

Treasurer:

Rev. T. A. Preston.

Librarian:

E. Almack.

Committee:

The Ex-officio Members.
F. Giles.
C. M. Bull, Esq.
W. D. Fenning.

Honorary Members:

The Rev. The Master.
A. Armstrong, Esq.
H. M. Moule, Esq.
W. E. Mullins, Esq.
F. E. Thompson, Esq.
C. M. Bull, Esq.
Rev. J. F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq., Jun.
W. H. Macdonald, Esq.
F. Storr, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. R. Dumergue, Esq.

Members:

F. J. H. Jenkinson.
A. C. Hilton.
H. M. Hilton.
E. Almack.
J. B. Oakeley.
P. G. Young.
W. G. de Jersey.
F. J. C. Boles.
J. B. Fuller.
M. H. Smith.
G. E. Manisty.
M. H. Soames.
H. Manders.
A. H. B. Reynardson.
J. S. Woodhouse.
E. C. Sewell.
C. A. Sladen.
E. L. Hesketh.
B. J. Guillemard.
H. S. Sankey.
C. F. Harrison.
T. W. E. Harvey.
W. D. Fenning.
L. C. Calley.
A. de B. Hovell.
H. J. Verrall.
P. L. Hesketh.
J. W. Hockin.
F. Giles.
E. H. Wyatt.
H. R. Armstrong.
C. J. Irwin.
A. C. Blaker.
J. F. Cornish.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members and Honorary Members.

Officers.

3.—That the officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

Management.

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any member of the Society to take the chair.

Committee.

7.—That on the occurrence of any election, each member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in Editing the Report.

Secretary.

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

Treasurer.

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order, or in his absence that of the Secretary.

Librarian.

14.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

Library.

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

19.—That any member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purposes of study, provided there be a reasonable excuse for their not belonging to a section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

Members.

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.*, to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1*s.* on Election.

25.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the report half-yearly.

Visitors.

26.—That on such occasions when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

Honorary Members.

27.—That Honorary Members have all the privileges of Members, except the power of introducing a member of the School to the meetings of the Society.

Suspension of Members.

28.—That any member be liable to be excluded from the Society by the Committee if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

29.—That sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these sections shall hold meetings as often as shall seem fit to the Heads of the several sections, at which any member of the School, with the sanction of the Head of that section, may attend.

Meetings.

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD AUGUST 21st, 1868.

The following donations were announced, and thanks ordered to be given to the Donors :—

A specimen of Apatite, by S. B. Dixon, Esq.

A Swiss specimen of the Queen of Spain Fritillary *(H. Lathonia)*, by Rev. A. Butler.

A box of moths, by A. Marshall.

Three Quail's eggs, by T. Tilleard.

A specimen of Bee-eater from Spain, by E. S. Preston.

A collection of about 70 Coins, mostly Roman, by E. C. Sewell.

Another collection of about 50 Coins, by C. E. G. Crawford.

An Indian gold rupee, by C. A. Harrison.

Exhibitions.

Geology.—Calamite from the Coal-measures by E. Almack.

A piece of Shakspeare's Cliff, by H. M. Hilton.

Entomology.—A box of moths collected by himself, by H. M. Hilton.

A series of varieties of *Cosmia Trapezina*, by A. C. Hilton.

Ornithology.—A Nightingale's nest from Bucks, by E. Almack.

An Indian Jay, by J. B. Oakeley.

A collection of eggs sent by Mr. Baker of Cambridge.

Archæology.—A collection of English Coins, by H. S. Sankey.

Botany.—Specimens of hemp and *Hordeum Pratense* (new to the List), by the President.

A vote of thanks to Mr. Baverstock for his presentation to the Society of the President's portrait was proposed and unanimously carried.

F. Giles was elected a Member.

There were 66 persons present: 4 Honorary Members, 25 Members, and 37 Visitors.

MEETING HELD SEPTEMBER 4th, 1868.

The following donations were announced, and thanks ordered to be given to the Donors :—

Several Eocene fossils from Bognor, by F. Giles.

A Chinese silver medal, by Mr. Chivers of Marlborough.

The jaw of a young Shark, by Mr. Hawkins.

White's "Natural History of Selborne," by F. Madan.

EXHIBITIONS.

Geology.—A species of Ammonite from the Lias, by E. Almack.

Entomology.—A box of moths, captured by himself, by H. M. Hilton, who passed round a list of notices for August.

A Convolvulus Hawk-moth, *(S. Convolvuli)*, by the President.

A Hornet's nest, by E. im Thurn.

Archæology.—A piece of Roman pavement from Chedworth, by E. C. Sewell.

An ancient Roman lamp, and a monk's arm-bone from the convent of the Capucini, at Rome, by F. Storr, Esq.

Botany.—A living specimen of the New Holland Pitcher-plant, (*Cephalotus follicularis)* by E. im Thurn.

Zoology.—Two teeth of a Spermaceti Whale, lent by Mr. Hawkins.

A hare's head, in which the teeth were greatly malformed, by the President.

F. STORR, ESQ., read the following paper on the

METAMORPHOSIS OF PLANTS.

THE word Metamorphosis will be familiar to most of you, though the connection in which it is used may sound strange to many. Some of you may remember Proteus' complaint in the "Two Gentlemen of Verona,"

"Thou Julia, thou hast metamorphosed me,
Made me neglect my studies, lose my time."

(a result which it is to be hoped will not follow from our study of Natural History to-night).

All of you have heard of, if you have not read, the Metamorphoses of Ovid, the loves of Apollo and Daphne, of Tereus and Philomel, of Pan and Syrinx,

"How down Mænalus
I pursued a maiden and grasped a reid,
Gods and men, we are all deluded thus."

The changes I have to tell you of to-night are not less wonderful though they rest on better evidence, in fact the evidence of your own senses, as I hope to show you before I have done. But before I proceed to my subject, it may not be out of place to ask you a question, the answer to which is not so obvious as at first sight it seems. Why do you disbelieve such stories? Oh, you will say, no one ever did believe them. Take another case then. Sir John Mandeville, by all reports a very honest gentlemen, tells us that in his travels he came across a nation who were blessed with very broad feet, so broad that they used them for parasols and sat under their shadow, for it was a hot climate they lived in. No one believes this now-a-days; and yet when Mr. Lewes tells of polypi who can turn themselves inside out, convert their backs into stomachs, and live on very comfortably, we are content to take his word for it. Why do we believe the one story and reject the other? What is our test of credibility? Is it not this—the uniformity of Nature, uniformity subject it is true to endless variety, but varying only within certain limits and subject to certain unvarying laws.

To return to our subject: the word metamorphosis in its technical sense is, strictly speaking, confined to the animal kingdom. It is first used by Henry to express the various changes the animal undergoes in its developement from the fœtus to the adult. Just in the same way the entomologist applies it to the various changes of the insect from grub to chrysalis, and from chrysalis to imago.

The conception you must form of the metamorphosis of plants is slightly different to this. The leaf does not change into pistil and petal, nor does the pistil in its turn produce the leaf. That would be Metamorphosis in the proper sense of the word: rather we must represent to ourselves the whole plant as a series of repetitions of the same type variously modified, and that type we have agreed to call the leaf.

Such is a bare statement of the theory which has received the name of Metamorphosis of plants. Strange as it may appear to you, calyx, corolla, bud, stamens, pistil, differing as they do in colour, form, and consistency, are but modifications of one type, variously dispersed, a very Proteus we may call it, but always like Proteus (if we possess the proper charm), reducible to the original type, which type is the leaf. Before proceeding to discuss in order the various parts of the plant, I will take one instance of Metamorphosis with which you are all familiar, which you have seen a thousand times, though I dare say none of you has ever paid attention to it, or thought of asking himself the explanation of it. You all know a garden rose, you most of you know that it is the same plant as the hedge rose, only modified by cultivation, you can tell me in terms more or less vague the difference between the two flowers. But I doubt whether any of you, if he has not read modern books of botany, can describe exactly what has taken place to turn a dog-rose into a cabbage-rose. Now put the two side by side, you will see that the dog-rose, has 5 petals, and an indefinite number of stamens, the cabbage-rose has an indefinite number of petals and comparatively few stamens, sometimes none at all. Is not the natural conclusion this, the petals have been *transformed* into stamens?

This is what is called by Botanists irregular Metamorphosis, an anomaly produced by cultivation, a retrograde step, so to speak; the usual order has been reversed. But it is from these *lusus naturæ*, these freaks of nature, that we gain the clue by which to trace her regular method of operation. From the exception we learn the rule, just as the physician by studying disease arrives at the laws of health.

We will now examine the *regular* Metamorphosis as it proceeds from the seed to the perfect flower. When a seed begins to germinate, the first organ of its upward growth assumes very various forms, but they all have received the common name of *cotyledons* or seed-leaves. When below ground, they are thick and fleshy, but when appearing above ground, they are flatter and greenish, and in some plants, as the lime and sycamore, bear a close resemblance to the leaf. On being exposed to light and air their surface assumes a deeper green, is intersected with veins, and approaches more and more closely to the true leaf. They appear in pairs or, if more than two, start from a common axis, whereas the subsequent leaves are oftener alternate.

The *first leaves* of the plant differ from the cotyledons in their flatness and delicate texture, but they are still imperfect as compared with the upper leaves of the plant; at each successive stage the midrib lengthens, and the leaf itself becomes more deeply notched and indented. Nor are we at a loss to discover the means by which this elaboration is effected. It is due to the chemical action of those omnipresent agents light and air. The cotyledons are charged with a crude kind of sap, and this is gradually rarified and sublimated in the upward progress of the plant. We have a curious proof of this in the leaves of the water-ranunculus and other aquatic plants. Some of these are found beneath the water, and these are capillaceous, hair-like or stringy, like sea-weed, others exposed to the sun and air are broad and have their veins connected like other leaves.

George Stephenson was once staying with Sir Robert Peel, at his seat near Tamworth. "What is it," asked the engineer, as they watched an express train flying past, "that's driving that train?" "One of your black drivers I suppose," said Sir Robert. "No." "Steam, then, I suppose you mean." "No, try again." "I give it up." "It's bottled sunlight" said Stephenson. And so it was, it was by the chemical action of the sun's rays that the tree had elaborated that carbon which had for centuries lain dormant in the bowels of the earth, till it was dug up and converted into active force and set to turn the wheels of that wonderful mechanism which Stephenson himself invented.

But like Jack the Giant-killer we must make haste and mount our bean stalk till we reach the blossom. How soon that will be, depends on the amount of nourishment the plant receives, and this stage may be indefinitely accelerated or retarded. For no blossom can be formed till the crude juices have been carried off and the sap sufficiently elaborated.

When this condition is attained, the stem begins to taper, shoots rapidly upwards from the node at which the last leaves were formed, and developes simultaneously a whorl of leaves round an axis, called by the collective name of calyx; the separate leaves which form it are called sepals. That these are leaves, the same organs in fact as those whose formation we have been observing on the stem, is a fact which admits of the clearest proof. It is true that, unlike the stem leaves, they are collected round a common centre, but this phenomenon we have witnessed already in the cotyledons. The only other remarkable difference is that they are more or less closely united together. But it is a well known law that organs in close contiguity have a constant tendency to cohere, and we may observe in different plants or sometimes in different specimens, the subtle gradations by which the polysepalous passes into the monosepalous calyx. You may observe, too, in many plants two or more small leaves under the calyx, and differing only in size from the regular stem leaves. So, too, the common calyx or *involucre* of composite flowers, such as the Marigold, presents a striking example of the gradual transition from leaf to sepal. Some flowers again, as the Pink, have a second outside calyx, called the *epicalyx*, a sort of preliminary attempt of Nature at the regular calyx.

We have seen how the calyx is produced by the contraction and compression of the leaves; by a similar process the next whorl is formed immediately inside the first, differing still further in colour and texture from the ordinary leaf. One might almost compare the calyx to a rude pipe from which the corolla like a rainbow-coloured bubble—

"Mille trahens varios adverso sole colores"

is blown. Yet even here the close resemblance between a petal and a leaf is so well marked that no one would dispute it when it had once been pointed out to him. The separate parts of each, midrib, claw and petiole, blade and lamina, whether called by the same or distinctive names, all are strictly analogous. And, as in the calyx, there is no lack of witness in which we may mark the transition not fully completed or only just begun. You may often notice half-way up the stem of the tulip coloured leaves, petals, as it were, born before their time. The petals of the white water lily are of a deep green on the outside, while the inner side is a pinkish white, an evident approximation to the colour of the petals.

So far you will have had no difficulty in following me, the connection between the different parts has been comparatively simple and obvious. The next step, as I hope to prove to you, rests on no less satisfactory evidence, but it is not so conspicuous, it will require a greater stretch of the imagination, or, more strictly speaking, of the reason, to grasp it. Nothing less like a leaf at first sight than those sticks with a knob at the top which form the next whorl of the flower. But look a little closer. Observe that the stamen, like the leaf, consists of two parts, the lower part is thin and stalk-like, the upper part is thickened and divided into two lobes, separated by a connective. It is in fact a leaf with the petiole (in this case called the filament) lengthened out, and the blade (now called the anther) contracted and thickened. This is what analogy would lead us to expect, but it is placed beyond all doubt by what happens in abnormal cases or monstrosities, as they are called by Botanists. You are closely acquainted with one familiar instance, the rose, in which the stamens are all, or part of them, transformed into perfect petals. Seize the first opportunity you can of observing any quantity of roses. If you are fortunate, you will discover specimens in which the conversion is only partial, you will find among perfect coloured petals others which are contracted both in the middle and at the sides, at the end of others you will observe protuberances more or less resembling a perfect anther. In the common water-lily you will find it often impossible to determine where the petals end and the stamens begin, so subtle are the gradations by which one passes into the other.

When all the stamens are changed into petals, the flower is barren, but if, as often happens, any stamens are developed whilst the process by which the flower becomes double is going forward, fertilization may take place.

We have now reached the last series of flower leaves which occupy the centre of the flower. This is called the pistil. It is sometimes single, sometimes consists of a number of styles, either separate or united. The similarity between them and the stamens is so obvious that I may pass quickly over this stage. In many instances the style has almost the appearance of a filament without an anther, in others, as the Iris, the style closely resembles a petal. It is within the developed pistil, as you all know, that the seeds are formed. A pea or bean pod is nothing but a ripened pistil, the pod is nothing but a leaf welded together at its edges so as to form a receptacle for the seeds. In other instances, as the buttercup, the ovary is compound. Here a number of leaves have been folded up separately and each of them holds its seed. In this organ, too, similar monstrosities occur showing its true nature. The capsule of the pink is often transformed into a true calyx, and little remnants of styles and stigmas may be observed attached to the tips of this division. In the family of Ferns the seeds are left unprotected, being arranged in rows on the backs of the leaflets.

The seed itself assumes a multitude of different forms; in no organ of the plant is there greater variety. But in each case the outer covering is nothing but a transformed leaf, variously adapted so as to form a complete envelope for the germ. I have not time to go through instances, but I recommend all of you who are interested in the subject to take some common fruit—hips and haws, apples, blackberries, and try and make out for yourselves, from what part or parts of the flower the fruit results. There cannot be a more instructive exercise than this, or one which will better show you the wonderful developements and changes which the various organs undergo.

We began with the seed, and we have come back to the seed again. The circle is complete, we have traced the plant through all its developements. There is one organ, however, which I purposely omitted in its proper place, as not forming an internal portion of the flower like the other parts which we have considered. But this organ presents too striking an exemplification of our theory to be entirely passed over. The nectary is that part of the flower which contains a honey-like secretion. Its form and position are most various, sometimes it is a simple gland, sometimes a lobe of the disk, sometimes a spur; but it may generally be considered as a transitional stage between the petals and stamens, that is its usual position; sometimes it resembles a filament without an anther, sometimes an anther without a filament, sometimes, as in the orchids, it is an elongated petal, attaining in some instances nearly a foot in length.

Some of you may wish to know what is the relation of the bud to the plant. Is it a leaf or a collection of leaves? Not exactly. A bud is an embryo plant, a distinct little plant in itself. There are two distinct processes of vegetable reproduction, the usual process with which you are already acquainted, and, alternating with this or proceeding simultaneously, the multiplication by buds. Each bud is an individual plant, it may be transferred to another plant by the familiar operation of budding, or it may establish a separate existence of its own, as when propagation is effected by slips or cuttings. A bud requires no cotyledons because it is connected with and draws its nourishment from the parent plant. In lower organizations the difference between buds and seeds is imperceptible. So in those wonderful elementary forms of vegetation, the Protophytes, which occupy as it were the borderland between the animal and vegetable kingdoms, multiplication is effected by duplication and subdivision. The original little globule or cell contracts like an hour-glass; others divide into two, as though a plant were to shed its buds, and from these buds there sprang at once plants as fully formed and organized as the mother plant. In the Protococcus, for example, the mystical birth of Athene is effected before our very eyes. Among higher organizations the nearest approach to such a process is to be found in the Hen and Chicken daisy. Here buds are formed in the axils of the leaves of the involucre, which blossom at the same time as the mother flower.

I have said nothing of the stem and root. Whether, as was first thought when this theory was originally propounded, these too ought to be referred to the same type, seems to me very doubtful. It is true that in some instances, as the orange tree and butcher's broom, the stem is flattened out and assumes a very leaf-like appearance. But such cases seem too exceptional to establish a general theory, we shall I imagine gain a truer conception of their character by referring them to a distinct type. Accordingly the plant will bear two typical forms, the leaf and the stem.

Our explanation, so far as it goes, applies only to a single flower growing from a single stalk or scape, a tulip for instance. But from what has been said about buds, it will be seen that the theory holds good for all flowers, whether borne on a succession of pedicels, or on pedicels all springing from one point. All flowers developed from axillary buds are to be regarded as perfect plants. Let us go a step further and consider a composite flower, a daisy or dandelion. There is first a compound calyx or involucre, and within this the flower produces all its axillary buds simultaneously in the form of flowers placed in the closest proximity. It is as though you drew a stalk through your fingers from the root upwards till you held all the separate flowers pressed together in a thick bunch at the top.

Before concluding I will give you two striking examples of irregular metamorphosis, showing how one organ passes into another, and proving indisputably their common origin, for in Nature's wildest freaks there is always method. Men do not gather grapes of thorns or figs of thistles. In the memoirs of the Paris Linnæan Society is a very interesting account of the Saint Valery apple tree; the flower is quite destitute of stamens and petals, but the calyx is formed of ten sepals in two rows, the pistil is composed of 14 carpels. The owner of the tree saw it in full bloom several years following without bearing any fruit, and was going to cut it down, but a doctor advised him to try fertilizing artificially the pistillate flowers by means of complete flowers gathered from ordinary trees; the experiment succeeded perfectly, and ever since the ladies of St. Valery make a holiday in the month of May, and bring flowers with pollen to the barren tree; each one shakes some over a flower, *Elle fait sa pomme*, as they call it, and attaches a riband to recognize it again. In the autumn the tree is covered with apples differing in size, shape, and colour, according to the variety from which the flower has been plucked, but all the apples present the same peculiarity, the apple has two cores, one in the middle of 5 cells like a common apple, another two-thirds of the way down of nine cells, showing that there are really two apples interfused and welded together. The double calyx shows clearly that there will be two calyx tubes, the 14 carpels, that there is a double ovary, one of 5 (as in the common apple), and one of nine carpels. In this case there has been a metamorphosis of stamens into sepals and carpels.

There is a variety of Rose well known to horticulturists under the name of the Proliferous Rose. As in the ordinary rose the calyx and corolla are arranged regularly round the axis, only the calyx is generally transformed into ordinary stem-leaves, the stamens are fewer in number than in the ordinary rose, but the carpels are abortive and from the centre of the flower the stem ascends again, and on this prolonged axis are developed dark red petals of a smaller size, on some of which are visible traces of anthers; these continue to diminish in size and change at last into stem-leaves: a series of regular nodes is formed and from their axils small imperfect rose-buds burst forth. The explanation of this phenomenon is only conjectural, but it may probably be accounted for thus. Every flower is terminal. The flowering cannot take place till the crude juices first absorbed by the roots have been carried off and the sap sufficiently sublimated and refined. When the flowering has taken place the vegetative force is exhausted and growth ceases.

In the case of the Proliferous Rose it seems as though the flowering period had begun too early. Hence the transformed sepals. The same cause, namely a superabundance of nutritive juices, will account for the abortive carpels. And then the force which would have gone to form the carpels produces instead the prolonged stem. Briefly, the phenonemon may be ascribed to alternate superabundance and exhaustion of the nutritive juices of the plant.

As far as my own defective knowledge and limited time would allow, I have expounded to you the Theory of the Metamorphosis of Plants. But my lecture would be very imperfect if I were not to tell you who was the discoverer of the Theory. No one can have studied, however superficially, the history of the inductive sciences without observing that each discovery belongs more to an age than an individual. Botany is no exception to the rule. The theory of Metamorphosis had been more or less clearly perceived, more or less distinctly enunciated, by many Botanists before the philosopher with whose name it is *par excellence* associated. In particular Wolff and Linnæus deserve honourable mention as precursors of, if not participators in, the discovery. But after all the true discoverer, the man who first grasped the theory as a whole and published it to the world, was without a doubt the great German Goethe. And who was Goethe? A poet, a philosopher, a statesman, anything but a professed Botanist. He took up Botany, just as any of you might take it up, not at the expense of his regular occupations; but as a relaxation; like the great Frenchman Rousseau, he made it the solace of his old age, the amusement of his leisure hour. And what was the method he pursued, by what steps did he attain these splendid results? A very simple method, one we can all of us put into practice—in one word, Patience.

Le génie, says Buffon, *le génie c'est le patience.* But you shall hear Goethe tell the story himself. "For-a-half-a-century," he tells us in the history of his Botanical Studies, "I have been known as a poet in my own country and abroad. No one thinks of refusing me that talent. But it is not generally known, that I have also occupied myself seriously through many years with the physical and physiological phenomena of Nature, observing them with the perseverance which passion alone can give. Thus when my essay on the developement of plants, published nearly forty years before, fixed the attention of Botanists in Switzerland and France, there seemed no expression for the astonishment at the fact of a poet thus going out of his route to make a discovery so important. It is to combat this false notion that I have written the history of my studies, to show that a great part of my life has been devoted to Natural History, for which I had a passion. It is by no sudden and unexpected inspiration of genius, but through long prosecuted studies, that I arrived at my results. I might doubtless have accepted the honour which they wished to pay my sagacity, and in secret rejoiced at it. But as it is equally pernicious in science to keep exclusively to facts or exclusively to abstract theories, I have deemed it my duty to write, for serious men, the detailed history of my studies." *

Noble words of ripe wisdom, instinct with the very spirit of Natural Philosophy, words which I will not weaken with any comment of my own.

There were 63 persons present; 7 Honorary Members, 26 Members; and 30 Visitors.

MEETING HELD SEPTEMBER 18TH, 1868.

THE following donations were announced, and thanks ordered to be given to the Donors:—

A collection of Roman Coins, by Rev. C. Soames.

Various Coins, by Rev. E. B.Warren, H. R. Armstrong, and A. de B. Hovell.

A large collection of Flint Implements from Yorkshire, by E. C. Scobell, Esq.

Two specimens of the Pale Clouded Yellow *(C. Hyale)*, by J. S.Woodhouse.

A specimen of the Linear Hawk-moth *(D. Livornica)*, by F. E. Thompson, Esq.

A specimen of Sponge from St. Domingo, by Mr. Hawkins.

EXHIBITIONS.

Entomology—A specimen of *C. Hyale*, by H. M. Hilton, who read a list of captures, in which were specimens of *S. Convolvuli* and *D. Livornica*.

Botany—A monstrosity of Lady's Slipper *(C. Calceolus)*, with two spurs, by E. im Thurn.

Specimens of the Fungus *Fistulina hepatica*, by H. R. Armstrong.

The Rev. T. W. Dowding gave a very interesting account of the wilful suffocation of 22 chickens in a tub 15 inches deep, and 22 inches across.

E. H. Wyatt and H. R. Armstrong were elected Members.

F. E. Thompson, Esq., read the following Paper, entitled

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* Lewes' Life of Goethe. From this work and Goethe's Metamorphoses der Pflanzen the principal materials for this lecture have been drawn.

A SHORT ACCOUNT OF THE FOOD COLLECTION AT THE SOUTH KENSINGTON MUSEUM.

MOST of you know by experience the unsatisfactory nature of the enjoyment derived from going over or "doing" a Museum. The day for the ceremony is probably fixed some time in advance. Speculation is rife, and anticipation on tiptoe. On such a day "we are going to the British Museum." The fatal hour arrives. The family moves off. It enters the great hall, and the different members, aimless, and methodless, drift through the weary and unintelligible saloons. At first mind and body, braced by self-deceptive expectation, bear up against the distraction, and the consciousness that we do not know what we are there for. But we are carried in through the Græco-Roman gallery: "There's Faustina!" "Who's Faustina?" Into the Lycian hall—"Ah No. 136, Frieze, representing a dance of Satyrs, what a queer thing!" To the great Egyptian gallery where, perhaps, a sarcophagus or a pophyry cat catches our eyes—the famous Rosetta stone is there, but we neither notice it, nor know anything about it: and so we float upstairs past the Gorilla, and the Greek vases, and the mummies and the South Sea islanders, the stuffed animals (how fusty they are!), and the Saurians, gazing at all things, but marking nothing, until at last fairly exhausted, disappointed, and ill-tempered the family collapses, or, happy thought! seeks refuge in the real business of the day, the refreshment room. Then possibly after one or two more ill-spent hours we return and with the elasticity of hypocrisy every body declares how delightful a day has been spent, and how instructive!

Yes, very satisfactory to have wasted a whole yesterday and to salve ourselves all round with an unctuous fib to-day.*

In my present paper I wish, while describing a Museum, to indicate *how* it should be visited.

Most of you know something of the South Kensington Museum—It contains many departments of science and art, all beautiful and delightful, among them the Food Collection. I cannot see everything in one day, I go therefore to one room, or one subject, and try to see that well. Such a course, I find by experience, yields the maximum of pleasure and profit with the minimum of aggravation. I enter the Food Museum. There I see an array of glass cases filled with different objects. The walls above are hung with explanatory diagrams, and tabular forms. At first I can make neither head nor tail of the place. I must once for all beg you to excuse the iteration of the first personal pronoun, and to understand it as a strictly impersonal formula. I enquire of a policeman which is the head, and which the tail, avoiding however metaphorical language. Then I begin. In front is a large table informing me of the constituents of the human body. To this is added a note explaining that the body is subject to constant waste, which waste must be constantly made good. Here then is the text of our alimentary sermon. Here is a rough definition of food. Food is the material for replenishing the waste of the body. Other tables classify the constituents. The human frame loses its moisture, its mineral matter, its heat, its muscles. Food therefore must supply water, minerals, carbon, and nitrogen. So the Museum is arranged according to the nature of the food essential or auxiliary to the preservation of the body in all its nice complexity.

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* The writer is very much indebted to Dr. Lankester's Lectures on Food, published by Hardwicke, Piccadilly. The paper is chiefly the result of very many visits to the Museum.

It is quite beyond my present purpose to attempt anything like an exhaustive description of the Collection. I shall merely try to classify the constituents of the human body, and the different kinds of food which supply the loss of those constituents. I shall then notice briefly one or two of the more out-of-the-way products to be seen in the Museum.

At the beginning of the Collection you will see two large tabular forms giving, one the *ultimate*, another the *proximate* elements of the body. Like the Conjuror before he shows his tricks, might I ask some person present, weighing about 11 stone, to lend himself for a few moments, his body I mean, not for analytical, but simply for illustrative purposes?

(A volunteer of suitable bulk comes forward.)

Here then is an organism weighing 154 lbs. or thereabouts. If we break up this "piece of work" we shall find that it consists in the first place of the elements contained in Table I.*

TABLE I.

Ultimate Elements of the Human Body.

	Lbs.	*oz.*	*grs.*
1.—Oxygen, a gas. The quantity contained in the body would occupy a space equal to 750 cubic feet	111	0	0
2.—Hydrogen, a gas. The lightest body in nature. The quantity present would occupy about 3,000 cubic feet...	14	0	0
3.—Carbon, a solid Animal Charcoal	21	0	0
4.—Nitrogen, a gas. It would occupy about 20 cubic feet when free	3	9	0
5.—Phosphorus, an inflammable solid	1	12	190
6.—Calcium, a solid, the metallic Base of Lime	2	0	0
7.—Sulphur, a solid	0	2	219

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* The tables are copied from the South Kensington Museum.

	Lbs.	*oz.*	*grs.*
8.—Fluorine, a gas. It is found united with Calcium in the bones	0	2	0
9.—Chlorine, a gas. Combined with sodium it forms common salt	0	2	382
10.—Sodium, a metal. It floats on water	0	2	116
11.—Iron, a metal	0	0	100
12.—Potassium, a metal. It floats on water, and burns when placed on it	0	0	290
13.—Magnesium, a metal	0	0	12
14.—Silicon, a metallic substance. It is found on the hair and teeth	0	0	2
	154	0	0

The substances in the above table are incapable of further separation. This is all the 154 lbs. before us consists of, leaving the soul out of the question, as confessedly immaterial. These elements, however, when combined, form a set of compound bodies called Proximate Principles, out of which tissues and fluids are formed. You will find them in Table II.

TABLE II.

Proximate Principles of the Human Body.

	Lbs.	*oz.*	*grs.*
1.—Water, oxygen and hydrogen mixed	111	0	0
2.—Gelatin, of which the walls of the cells and many tissues of the body, as skin and bones, are principally composed	15	0	0
3.—Fat	12	0	0
4.—Phosphate of lime, the principal part of the earthy matter of the bones	5	13	0
5.—Carbonate of lime, also entering into the composition of the bones	1	0	0
6.—Albumen, in the blood and nerves	4	3	0
7.—Fibrine, forming the muscles, and the clot and globules of the blood...	4	4	0
8.—Fluorine of calcium, in the bones	0	3	0
9.—Chloride of sodium, common salt	0	3	370
10.—Sulphate of soda	0	1	170
11.—Carbonate of soda	0	1	72
12.—Phosphate of soda	0	0	400
13.—Sulphate of potash	0	0	400
14.—Peroxide of iron	0	0	150
15.—Phosphate of potash	0	0	100

	Lbs.	oz.	grs.
16.—Phosphate of magnesia	0	0	75
17.—Silica...	0	0	3
18.—Chloride of potassium...	0	0	10
	154	0	0

Two cases in the Museum contain these substances, one the ultimate, the other the proximate elements. Here in Case 1 is a philosopher labelled in fourteen bottles. Case II contains the Proximate elements of "Imperial Cæsar" if you will—a tank holding 111 lbs. of water, a pile of gelatine looking like a stack of parlour hurdles, a big lump of fat, and a number of saucers and phials filled with phosphates and salts.

We can thus, you see, break up the human frame, but we cannot put it together again. Even a Frankenstein is with us an impossibility, man can destroy, God only can create :—

> "When I have plucked the rose,
> I cannot give it vital growth again,
> It needs must wither."

But food saves from destruction. Food is the constant repair of constant loss.

We have not yet, however, arrived at a classification of waste, or of food. If you refer to Table III below you will see that food is divided into two great classes, and seven groups. Food is either Alimentary or Necessary, Class I, or Medicinal, Class II.

TABLE III.

Classification of Food.

CLASS I.—ALIMENTARY OR NECESSARY.

Group 1.—Mineral :
- *a.* Water ;
- *b.* Salt ;
- *c.* Ashes of Plants and Animals.

Group 2.—Carbonaceous or Respiratory—Heat giving :
- *a.* Starch ;
- *b.* Sugar ;
- *c.* Fat.

Group 3.—Nitrogenous or Nutritious—Flesh-forming :
- *a.* Albumen ;
- *b.* Fibrine ;
- *c.* Caseine.

CLASS II.—MEDICINAL OR AUXILIARY.

Group 1.—Stimulants :
- *a.* Alcohol ;
- *b.* Volatile Oils.

Group 2.—Alteratives :

- a. Acids ;
- b. Alkaloids.

Group 3.—Narcotics :

- a. Tobacco ;
- b. Hemp ;
- c. Opium.

Group 4.—Accessories :

- a. Cellulose ;
- b. Gum ;
- c. Gelatine.

Now our organism of 154 lbs. contains no less than 111 lbs. of water. Exhaust this water from blood and tissues, and you have a shrivelled mummy weighing only 43lbs. Water therefore is necessary to life. Some plants and animals contain a still larger proportion than man. Thus the cabbage yields 92 per cent of water! Solid timber yields 30 per cent. Professor Owen found that a jelly fish weighed 2lbs. When the sun had dried the creature it was reduced to 16 grains. Well might the old Ionic philosophers guess that water was the origin of all things.

Continuing our anaylsis we shall next obtain a quantity of gases, and lastly a heap of ashes. "Pulvis et umbra sumus." In these ashes we obtain a variety of mineral substances or salts.

Here then we have the first group of our classification, subdivided into (*a*) Water; (*b*) Salt; (*c*) Ashes of plants and animals.

To proceed—The human body, when in health, has a fixed temperature in every climate, near the Poles or under the Equator. If you insert the bulb of a thermometer in any covered part of the body, under the tongue for instance, you will find the mercury rise to 98° or Blood Heat.

"'Tis thus the Mercury of man is fixed."

This heat is generated by the union of carbon in the body with the oxygen of the air, the result being given off in the form of carbonic acid by the organs of respiration. We thus arrive at our second group of Carbonaceous, Respiratory, or Heat-giving food, subdivided into (*a*) Starch; (*b*) Sugar; (*c*) Fat.

Again, we perceive and think with the brain, which is nervous matter. We see, hear, taste, touch, and smell by the agency of the nerves; we act with muscles. Now nervous and muscular tissue contains a further chemical element, nitrogen. A further group therefore is necessary, consisting of nitrogenous, flesh-forming, or nutritious substances providing us with (*a*) Albumen; (*b*) Fibrine; (*c*) Caseine.

These three groups contain all that is necessary to life. All other material taken into the body acts like medicine in the way of stimulants, alteratives, narcotics, or accessories.

I can only give a brief account of Class I, with perhaps a glance at some fancy items in Class II.

To begin with *water*. Water enters into the composition of all plants and animals. Plants absorb it, and extract from it the materials of life. Animals drink it, and feed on plants. Thus, at first and second hand, we take water as food. We take it at second hand in a multitude of ways; in tea, coffee, beer, wine; in flour, which contains 14 per cent. of water; in cheese, which contains 40; mutton 44, beef 50, potatoes 75, fish 78, eggs 80, turnips 87, and, from above, cabbages 92.

Let us see what are its uses. When introduced into the system, with the help of the saliva, it dissolves our food, and so renders it digestible. This is its most important operation.

Water, therefore, being so universally employed, it is of the greatest importance that a pure supply be at hand. The purest of all water is rain falling through a clean country atmosphere. Water however for drinking purposes is mainly derived from rivers, springs, and wells. Such waters contract many impurities from the soils through which they pass.

The London water, taken from the clay, is very bright and sparkling. These qualities are due to the decomposition of mineral or vegetable matter. The churchyard pump is invariably the favourite pump. London water is also very cooling. This property no less arises from the formation of salts in decomposing organic matter. As a rule it may be said that the dangerous stage of matter is the putrescent, decomposing, or fermenting stage. When that stage is past new substances may be formed most healthful and essential. Waters also are heavily charged with chemical and mineral matters, with gases and salts. Such are the springs of Bath, Harrogate, and Seltzer. Our Marlborough water holds in solution a considerable amount of chalk, or carbonate of lime. This is the fur which collects inside the familiar kettle, for boiling precipitates the chalk.

The museum then contains a great number of glasses holding unfiltered waters, which reveal to the naked eye, and much more to the microscope, a wondrous collection of animal matter living and dead, of plants, and of minerals. Some jars are perfect vivaria, or rather mortuaria. A cistern of Grand Junction Water, besides fish, snails, reeds, and weeds, reveals ten varieties of microscopic creatures, active and stationary, brown and green sporules, threads of fungus, grit, debris, and earth.

But the museum not only warns us of impurities, it also provides remedies. Close by is an assemblage of filters and tests; of the former the most interesting is "the poor man's filter," constructed in the following very simple manner: a garden pot, the hole plugged not too tightly with a sponge, a layer of charcoal two inches thick, a second layer of clean sand, a third of coarsish gravel. It is a very effective apparatus.

A very pretty test of the presence of organic impurity is also given. Permanganate of soda contains a large quantity of oxygen. When brought into contact with organic substances the permanganate loses its oxygen and its colour. This preparation, known familiarly as Condy's disinfecting fluid, has been poured into about a dozen jars. The purer the water the brighter the colour. There is every variety of hue from a brilliant carmine to an unhealthy whity-pink.

Let us now pass on to the salts we take as food. Referring to Table II., you will see that our bodies contain phosphate of lime in the bones; carbonate of lime, or chalk, also in the bones; phosphate of magnesia in the bones again, and the fluids; chloride of sodium (common salt) in the blood; iron in the blood, gastric juice, hair and eyes: silica in the teeth. Those who attend Mr. Dixon's geological lectures will be interested to trace in the chalk and silica the relation we bear to the rhizopods, and the diatomaceæ. As we moult therefore these materials must be replenished, or we shall inevitably die. It is through neglect of this kind of food, according to Dr. Lankester, that "babies get rickets, young ladies acquire crooked spines, fathers get gouty, and mothers have palpitations."

Salt first. Its analysis shows how two substances destructive to life may combine to form a compound absolutely essential to it. It consists of chlorine, a suffocating gas, and sodium, a metal so inflammable that it must be kept in water.

Salt exists in the blood. We have all cut our fingers, sucked them, and tasted the salt. Next time you cut yourself if you take a drop of blood, place it on a glass, and hold it over a spirit lamp, the water will evaporate and a residuum of rock crystals will be left. I hope however you will not carry your scientific enthusiasm so far as to emulate the worshippers of Baal.

Salt therefore is essential to life. Its uses are very important. First it facilitates the absorption of water into the system; secondly it supplies chlorine to the gastric juice which dissolves our food; thirdly it dissolves our food, and so enables it to pass into the blood, without doing which it would not be food. Salt also preserves meats, vegetables, and fruits. The Museum contains many specimens of rock-salt from the New Red Sandstone of Cheshire; of salt pumped from brine springs; of salted fruits and vegetables.

Our phosphates and salts of potash we get from two sources, animals and plants, from the grasses especially. Animals derive them from plants, plants from minerals.

You have often seen the family cat strolling down the garden at the hour of breakfast, and gathering a refreshing mouthful of grass, eating its salad in fact. Instinct has guided it in this way to avoid rickets for its kittens, palpitations or gout for itself.

But plants again extract these substances from minerals. Where there are no phosphates there are no grain crops. A soil without phosphates means a perishing nation. Baron Liebig's theory of the destruction of the great cities of antiquity, Babylon, Tyre, and others, is that it was due to the disappearance of phosphates. In America where land, for the present, is unlimited, when the farmer has exhausted the soil in the East, he moves westwards. In our own little island necessity has forced us to invent phosphates. Hence our artificial manures.

The main sources of potash are the potato, carrot, radish, watercress, lettuce, and so on, which therefore are essential to life. The potato is connected with an interesting theory. When brought into Europe it was devoured with an instinctive avidity. A Solano-mania seized on the Old World. At the same time black deaths and sweating sicknesses disappeared. Had the potato anything to do with this? Is it the old fallacy of *post hoc propter hoc* to think so? Some scientific men say No, reasoning thus—Potash oxidises, the potato contains potash. It oxidised the unwholesome lazar-like blood of the sixteenth century, and expelled disease.

I pass on to Group 2. The carbon and hydrogen within us combine with the oxygen of the air, and the fire is kindled. The body is the furnace, the mouth the chimney, the breath the smoke. The fuel is food: the stoker is man himself, who usually performs his work cheerfully enough.

Starch consists of carbon and water. Hence its heating power. You must not however fancy that if you bought a pound of grocer's starch on a cold day, and swallowed it you would walk about in a summer heat of your own creation. Carbon itself is indigestible. When taken in the form of starch it must first be fermented, and turned into sugar by the saliva before it can pass into the blood. Starch is found in many plants, especially in such as arrowroot, tapioca, sago, potato, rice, wheat, flour, lichens. The Museum contains several curious varieties of these plants, and their products. There is the Iceland moss. To get at this the reindeer turns up the overlying snow with his nose and so keeps up his internal fire. There is the male orchis from which was made Saloop, which within the last thirty years was sold in the streets of London as a substitute for tea or coffee; the Arctic lichen, called the Tripe de Roche on which many a navigator has had mainly to live; many sea-weeds such as Laver, Dulse, and the Irish moss, a handful of which may be bought any day for a halfpenny in the streets of Cork, and others which Horace thought useful only as furnishing a symbol of uselessness.

Starch can be converted to sugar. Sugar will ferment and yield alcohol. Hence from starchy plants are obtained a vast variety of compounds. I remember some time back a lecture on the Potato by our President, in which he showed some thirty or forty articles formed from this Protean vegetable, starch, arrowroot, sago, sugar, syrup, brandy, champagne, and so on.

There are many specimens of sugar, from the cane, from milk, from the Chinese sugar millet, from the birch, the palm, and many other sources.

Many curious sugar-yielding substances are also shown; for instance, one sort of manna which exudes from a species of ash, the Fraxinus ornus: another which is secreted by the pupa of an insect of the Psylla family, and gathered from the leaves of an Australian plant, the Eucalyptus Annosa.

You remember how, after Trafalgar, Napoleon tried to ruin British Commerce by excluding it from Continental ports. Cane sugar was thus excluded. But sugar is necessary to life, and Nature is stronger than Napoleon. A German soon invented a process, which the French employed, of extracting sugar from the beet. An old member of the School, a year or two ago, just returned from a West Indian plantation, complained to me that the Beet had nearly ousted the Cane from the European market.

In America and Canada sugar is also obtained in large quantities from the Sugar Maple. The tree is scored, or fluted, and the gum drips down into a pail. Cakes made of it are sold in every railway car. Before leaving Quebec I had a fancy for procuring a small specimen for the Natural History Society. Entering a store I asked the man for one of his smallest cakes. He disappeared and soon returned with a block weighing about 9 lbs, and looking like a corner-stone of Herod's temple.

I must however hasten on. The last sources of heat are fat, oil, and butter. These substances contain less oxygen than starch and sugar, and therefore more carbon. Fat itself is indigestible, but the bile of the liver renders it soluble. Fat protects the cells of the body, and acts as a kind of coal cellar against a cold day, being a bad conductor of heat. Hence the dormouse and hedgehog take in a superflous stock in summer, and sleep during winter. When therefore people waste away, cod liver oil is given them. In cold climates, fat, in some shape or other, is eaten in large quantities. An Esquimaux is said to take 20 lbs. of blubber at a meal. Dr. Lankester tells a good story of some Russian sailors being at one of our seaports during the Great War. The streets were then lighted with oil lamps—one cold night all the lamps went out. It was found that the Russians had swarmed the lamp posts and lapped up the oil.

The last and most important class of food is the nitrogenous, from which are formed the nervous and muscular tissues by the agency of which sensation, perception, thought, and action, are possible. We cannot move our muscles, we cannot listen to nonsense, we cannot think without waste. Hence our hunger after play and work alike, and hence, immoral as the statement sounds, work and play, in a physical sense, are literally identical.

Our friend of 154 lbs. loses one-fortieth of his substance per diem. He is ever changing, ever making good the old axiom of Heracleitus, that all is in a state of flux, πάντα ῥεῖ.

These tissues of thought and action contain all the four elements, oxygen, hydrogen, carbon, and nitrogen. Our food must contain them too. As usual the sources are twofold, vegetable and mineral. The ox and the sheep derive them from plants, plants from minerals. Thus we get a new conception of the unity of nature, of the "great chain which drawing all to agree" connects the inanimate rocks with the brain of a Socrates, a Cæsar, and a Shakspere.

Such foods yield the necessary substance in three forms, Albumen, Fibrine, and Caseine. There is a base common to all three modifications.—A plant cell for instance contains a dark eye or nucleus—This nucleus consists of a substance called Proteine, of which Albumen, Fibrine, and Caseine are so many manifestations. The white and yolk of egg consist of albumen—albumen exists in the blood of animals, and in plants. Alcohol coagulates albumen. Hence the intemperate use of ardent spirits renders our food indigestible and useless; and hence the haggardness and wasting away of the drunkard.

Fibrine is in the blood, it is the substance which entangling the red substance forms a clot of blood. It is identical with gluten in plants.

Caseine is the substance in milk from which cheeses are made.

The vegetables which supply us with our chief stock of proteine are the cereals. Oats and barley contain more of this matter, and therefore are more nutritious, than wheat. This is partly why the Scotch are so shrewd. The Museum gives abundant specimens of all kinds of proteine-yielding plants, maize, beans, peas, lentils, buckwheat, &c. Peas and lentils are very nutritious. No wonder therefore Daniel and his three friends at the Court of Babylon continued to be fat and well liking. The fruit of the bread tree (Artocarpus Incisa) from the South Sea Islands is exhibited. Potatoes contain a very small modicum of proteine and therefore are not adapted to serve as a general food. A hard-thinking and hard-working nation can never be a potato-eating nation. To build up nerves and muscles more nitrogenous food is absolutely indispensable.

Lastly with regard to animal nitrogenous food.

Milk is the type of all food. The young of mammals when fed solely on milk develope moisture, heat, tissues, and bones. Milk therefore is all food in itself.

Milk contains a large amount of caseine, and the essence of sugar. From the caseine of milk is made cheese, which contains, odd to say, more nutritious matter than meat. But you may have too much of a good thing. Excess of caseine is indigestible—cheese accordingly is indigestible. Caseine however possesses the unselfish property of decomposing and rendering digestible other matter. Hence cheese after meat, and hence the old rhyme:—

"Cheese is not a sordid elf,
Digesteth all things but itself."

Meat, besides containing Proteine, contains large quantities of gelatine. This gelatine you may be surprised to hear contains absolutely no nutriment whatever. It is useful however, for it forms the scaffolding of cells, and answers to fibrous matter in wood. Just as we give horses chopped straw to render their food digestible, so gelatine and the woody fibre of plants are useful. Careful analyses are given of different meats. Pork contains 10 per cent of nitrogen, lamb 11, mutton 12, beef 15, veal 16.

I have only time left to give you an analysis of one or two articles of food. You ought now to be able to understand the use of their several parts.

Thus 1 ℔ of figs contains—Water 2 oz., 254 grs.; gluten 420 grs.; sugar 9 ozs., 254 grs.; dextrine (gum) 70 grs.; woody fibre 1 oz., 263 grs.; fat 13 grs.; ashes 140 grs.

1 ℔ of turnips contains—water 14 ozs., 213 grs.; albumen and caseine 275 grs.: sugar 280 grs.; woody fibre 168 grs.; mineral matter or ashes 35 grs.

1 ℔ of tea contains—theine 210 grs.; caseine 2 ozs., 175 grs.; aromatic oil 4 ozs., 52 grs.; gum 2 ozs., 385 grs.; sugar 211 grs.; fat 280 grs.; tannic acid 4 ozs., 875 grs.; fibre 3 ozs., 87 grs.; mineral matter 350 grs.

A tea is shown, the flower of Pekoe, which costs fifty shillings a pound in China.

Cocoa in 100 parts contains 51 of fat, 22 of starch and gum, 20 of flesh-forming matter, 2 of theobromine, being far more nitrogenous and heat-giving than any flesh.

There is a case containing food remains from the lacustrine dwellings in Switzerland (lake of Pfäffiken, Zurich). There are carbonized apples, apple seeds, barley, bread, hazel nuts, millet, and waterlily seeds of a species now extinct.

A case of oriental dainties—serpents, sea slugs, ants, glue, fish maws and sharks fins, cockscombs (a favourite dish in the middle ages, and still brought to table in the South of France), and Kow-tow, a favourite Chinese fish, said to eat like mouldy cheese. Japanese sea-weeds, and numerous reptiles such as the Iguana.

I can only recommend you to study the public dietaries of soldiers, sailors, pensioners, paupers, and so on: and if you can stand such a Chamber of Horrors, to examine the collection of articles used to adulterate human food.

I fear I have long since exhausted you, but I have barely glanced at my subject. I earnestly hope I may have tempted some to acquaint themselves with this wonderful and beautiful collection.

Before parting let me answer one or two obvious objections. People will tell you that in choice of food instinct is sufficient, and that knowledge only makes us valetudinarians—with brutes instinct is doubtless fully sufficient, but with us I cannot understand how knowledge, rightly used, should not minister to our happiness. If it do not it must be so either from some moral imperfection, or some unsuspected deficiency in the knowledge itself.

It is all very well for the young and the wealthy to sneer at efforts to give life and happiness to the infirm and poor. True charity towards them should not tax our purses merely, it will call for the enlightened application of scientific knowledge. That such knowledge has ameliorated sickness and suffering, is demonstrable from the discovery that bad waters have been the cause of pestilence, that gelatine soup diet was killing off the country poor in France, that mortality among children in London was engendered by the use of stale milk.

In the happy epic days of youth, never to return, when the human stomach vies with the stomach of the ostrich, when hot buns, chemically adulterated pickles, and wedges of cake, before, during, and after dinner, interfere seemingly but little with happiness, we may afford to sneer; but those days soon pass away and widening experience teaches us that sufficient and wholesome food means health and activity of mind and body to the individual, energy and prosperity to the nation.

There were 87 persons present—3 honorary Members, 24 Members, and 60 Visitors.

MEETING HELD OCTOBER 2ND, 1868.

THE following donations were announced, and thanks ordered to be given to the Donors:—

A collection of English and Foreign Coins, by C. J. Irwin.

A fine Wasp's Nest, 37 inches in Circumference, by Dr. Fergus.

A collection of Minerals, by the Rev. J. Sowerby.

A Gourd and two Turtle's Heads, by Mr. Hawkins.

A specimen of the Land Crab from India, by Mr. E. Harraway.

EXHIBITIONS.

A Web of the Gossamer Spider, sent by Mr. G. Church, of Ramsbury.

Two plants new to the College List, the Bristly Helminthia *(H. Echioides)* by A. de B. Hovell, and the Stork's-bill *(Erodium Cicutarium)*.

A list of Moths taken during September was passed round by H. M. Hilton.

The following resolution was announced :—"That all Old Marlburians be eligible for election as honorary members of the Society, being subject to the ordinary half-yearly subscription of 2s. 6d." In accordance with this resolution J. F. Duthie, Esq., was elected an Honorary Member.

S. Image read the following Paper on

MONUMENTAL BRASSES.

THERE are doubtless some here to-night who will consider I have overstepped the limits of the fields of investigation to which a Natural History Society is ordinarily supposed to confine itself, in introducing to your notice in the present paper the study of Monumental Brasses.

To any such objectors I would once and for all reply that I believe this Society will most clearly vindicate its right to the title it professes, by extending its researches in, and giving its heartiest encouragement to, every branch of nature's handiwork alike, and to what more than to the study of man, her chiefest and noblest creation, and to all that concerns him whether in his natural or civilized condition. There may be, however, another class, who will be ready enough to allow the subject, the study of which I would advocate this evening, a place in the curriculum of our society, provided they can receive any sufficient reason for its introduction, and be shown any real advantage to be derived from its pursuit.

To the fair and honest questions of such gentlemen I would willingly endeavour to give a fair and honest answer: it is half victory to be able to give a reason for your actions.

That an accurate acquaintance with the social, religious, and political conditions of past generations is of infinite value as well as of infinite interest to ourselves appears at the present time so well established a fact, that I need scarcely here do more than point out how its existence is clearly evidenced by the daily increase of our love and respect for all connected with the past, and how we are hourly growing in the appreciation of all that is beautiful, and noble, and worthy in the works those ages have left to us. "A people may for a time under pressure of some violent crisis deny their past, even curse it"—says an able writer of our own day: but that spirit of blind fanaticism, has I hope, for ever past away, yielding place to a nobler and more healthy desire to learn from the past all the good the past can teach us: for apart from the mere interest and satisfaction such a study of bygone generations can afford us, great and valuable as I believe that in itself to be, it is still more valuable as a means of enlarging our morals and experiences, of cultivating our tastes, and of teaching us more or less directly such lessons of respect, humility, and large-heartedness, as we shall all do well to learn.

There are few things which help us more in the study of these past ages, or enable us more vividly to realize their manners and customs, their religious habits and sentiments, than a systematic examination of their sepulchral remains, where we find them still extant. Among the ancients the dead always received especial honour and respect; nor, as might be naturally expected, when the brighter light of Christianity dawned on the world was that pious care neglected or regarded as unnecessary. It is not, however, my object to-night to give you an account of all the various manners in which this honour was shown to the departed; but rather taking that individual class of sepulchral memorials, which is known by the name of "Monumental Brasses," to roughly sketch out the various interesting particulars connected with that study, in support of which I cannot refrain from quoting the words of an able writer on the subject, who in speaking of the advantages such a pursuit affords to the earnest investigator, remarks: "A careful survey of a series of the monumental brasses of this country would enable one to follow the gradual changes of manners and habits, to track the prominent feelings, and even to detect the religious emotions peculiar to each age; for not only the figure, its attitude and costume, but the inscription, and the subordinate parts of the design, all conspire to furnish a lively picture of the individual and his times."

It is my intention to-night to confine my observations as much as possible to the monumental brasses of our own country: for the subject is one which, if taken most generally and considered in all its direct and indirect associations, might be made so wide and comprehensive, that there would be neither time to speak on, nor perhaps, were that granted, would it be desirable for you in one paper to listen to, the various branch subjects, into which this study almost imperceptibly leads us.

It will be, however, necessary to say *something* about foreign brasses, in order to comprehend clearly, which is most essential, how and when arose the custom of commemorating the deceased by the erection of these monumental effigies, a custom which we find so frequent during part of the thirteenth, the fourteenth, and fifteenth centuries of the Christian era.

The source appears to have been two-fold.

From the 8th to the 12th century there was in vogue a very favourite style of sepulchral memorial, namely the *Incised* or *Engraved* slabs of flat stone, sometimes let into the ground, sometimes, as in an instance from Cornwall, erected to serve as an altar. These incised stones were of two distinct kinds; either the devices were cut into the stone, or else the interstices between the devices were graven out, thus leaving the pattern itself standing out in slight relief with a raised border round to serve at once for a protection and ornament.

We have here then one source from which the later brasses sprung.

The second was undoubtedly the celebrated "*Limoges*" *enamels.* This wonderful branch of art appears to have been introduced from Byzantium somewhere about the beginning of the 11th century, that is to say three hundred years or so after the earliest recorded instance of the flat incised stones I have just spoken of. This exquisite enamel work called "Limoges" from the town in France at which it was principally manufactured, was, as might be expected, soon found too expensive for any but the most wealthy nobility of the land. Athough therefore it was destined in itself never to be extensively employed for monumental purposes, it nevertheless paved the way for the introduction of the less costly, more durable, and in some respects, scarcely less beautiful species of effigy, namely the Monumental Brass.

From these two sources then we arrive at the actual introduction of the Brass Effigy, as we find specimens still extant in many of our older Churches. The earliest *recorded* specimen I have seen mentioned bears the date 1208. I say recorded, as I believe the earliest, or at any rate, earliest English Brass, remaining at the present day is that of Sir John D'Aubernoun, Stoke D'Abernon in Surrey, of the year 1277.

These brasses were of *two* distinct kinds. First, the *Flemish* brass, as it is called, and secondly, the *ordinary English* type, such as you see on the board.

To take the Flemish, or foreign style, first. It is not difficult to recognize as a general rule the specimens in England which still remain of these Flemish brasses from the genuine productions of the native English artist's hand. The whole style of art on the continent, whether we consider its architecture, painting, or decorative work, was of a far more elaborate and intricate a design than anything the English workman ever did or was ever likely to produce. I do not think this can be better evidenced than by a glance at the English and Foreign cathedrals. The stern severe massiveness of the one, and the intricate, richly adorned, elaborate design of the other, affords a most striking and instructive difference. I will pass you round a very beautiful photograph of Milan Cathedral, which will, I think, excellently show what I mean; we have nothing of this sort to be seen in England that I know of.

When we come to the monumental brass we still find this characteristic equally visible and distinct. Let me just point out a few of the more striking peculiarities that will easily enable us to distinguish at first sight the work of the Flemish and genuine English studio. I shall say first of all that these foreign specimens are called *Flemish*, since it is probable that many of the brasses on the continent, as well as those non-English ones in our own country, are the work of Flemish artists, who were early distinguished for their skill in this branch. The main characteristics are as follows. First, these brasses are composed of *one single large sheet of metal*, itself made up of neatly joined smaller pieces, and containing the entire design, that is to say, the figure, canopy, border, and other ornamentation, without any introduction of stone work between the various parts of the pattern. The design itself is intensely elaborate; the figures—for besides the one figure of the person deceased, there are introduced other smaller representations of angels, saints, and so on, round about the principal effigy—appear somewhat of a less stiff and conventional attitude than the purely English type. The ground work behind these figures being (and in this it is unlike the English School, which introduces stone) formed of metal, allows of very exquisite diaper patterns being engraved, and I believe in many instances, though now worn away, let in with enamel. The most remarkable feature however of the whole brass in these Flemish specimens is the Canopy. We often indeed find very beautiful and exquisitely worked canopies in our purely English designs. They are however, at any rate in elaborateness, far inferior to their foreign brethren. I have drawn out roughly on the board a fine specimen of the two Schools; and I think the characteristics are definitely enough marked there to want little or no more comment. You will see the introduction of the smaller figures in the canopy, and up the side of the brass, though not altogether unknown in English specimens—I may mention the brass of the last Prior of Lewes, now in Cowfold Church, Sussex, where there are three figures, the Blessed Virgin and Infant Christ, S. Pancratius, and S. Thomas of Canterbury—although I say these figures are not unknown, they are still exceedingly rare in English brasses, exceedingly common in foreign.

Before leaving this first division of the brass monumental effigies, let me mention one or two principal places in England where they are still to be seen. The earliest mentioned specimen is at Lynn, in Norfolk, 1349; another at Newcastle-on-Tyne, and one at S. Mary Quay, Ipswich, of the date 1525. One of the most beautiful I have ever seen of this style was a rubbing from the brass of Thomas de la Mere, at S. Alban's, somewhere about 1390. This brass was engraved by order of Thomas himself during his life-time, and had spaces left all round the border to be filled up after his death with an account of his worth and virtues. Either he failed in the latter, or was unfortunate enough to have no friend to fulfil his wishes; at any rate there is at present no trace of these blanks having ever been filled up with the desired record of the deceased abbot's good qualities.

Passing from the Flemish style we come to the genuine English school, of which there are so many excellent examples in nearly all the old Parish Churches in this country, more especially in the southern and midland counties. The point in which they are most strikingly different from the last-mentioned class is, that instead of having the design wholly contained in one sheet of metal, the various portions of it, such as the figure, canopy, and legend are let into a flat slab of stone, raised or not as the case may be, and thus setting off the pattern on a background of plain stone work. This naturally led to the second great difference, namely that you have little or no diaper work, less elaborate canopies, less intricate side borders; of course where there was no more metal used than was absolutely necessary, there could not be the same highly-finished, delicate engraving. True towards the end of the 16th and 17th centuries you do find specimens of English work on single plates; but the coarseness of the workmanship, the want of elaboration, and the *tout ensemble* of the whole design, render it absolutely impossible to confuse these debased specimens with the earlier and beautiful foreign instances of the 13th and 14th centuries.

I have spoken of and described the foreign Flemish brasses first, for although the earliest extant English specimen, which I have already mentioned of Sir John D'Aubernoun, is of the date 1277, some hundred years or so before the earliest Flemish brass I know of at Mawgan, in Cornwall, it is quite certain that the manufacture of these monuments was commenced and carried to a great perfection abroad long before they were definitely established in England as a branch of English art; although therefore they accidentally, so to speak, in England, come second, they ought intrinsically to demand our first attention.

Leaving, however, this rough comparison between the schools to fix our attention more exclusively on the latter, that is the purely English style, let me endeavour to point out a few of the leading characteristics of this branch and one or two of the more interesting details connected with it.

To take first what are called *Palimpsest* brasses; that is to say, a brass carved and intended at one date for some particular individual, and then afterwards employed as an effigy later on to commemorate somebody else. These *Palimpsests* are by no means uncommon, and I doubt not if many of the brasses in our churches were removed they would be found to belong to this class. There were three distinctly different modes of thus transferring the monument from the memory of one person to that of another. First, the original brass was taken up, and on the opposite side was carved afresh a figure and its accompaniments to suit the new owner. Thus, in a brass at Cobham, Surrey, we have on the one side the figure of a Priest in full Eucharistic Vestments, holding a chalice, of the date 1510 or thereabouts, and on the other that of a man in armour, evidently some 50 or 60 years later. To discover on the one side foreign workmanship, and on the other English is by no means of rare occurrence, as will seem natural if we remember that the actual brass plate was not manufactured in England till many years after the art of engraving the effigies even in our own country had attained to the highest perfection; indeed not till Elizabeth's reign, when the art was considerably on the decline.

The second class of these *Palimpsest* brasses are those in which the figure has been altered in parts to suit the style and costume of the individual now desired to be represented. Thus at Waterpery, Oxfordshire, we find the figures of a knight and lady, which had been altered from the style of the middle of the 15th century, to suit that of the middle of the 16th.

The third and last class is little other than a modification of No. 2, in which, though the figure remains untouched, the inscriptions and date have been changed to suit their new purpose. I think these last two classes teach pretty evidently how little attention was paid to giving any actual representation of the features and general aspect of the deceased, provided the date, inscription, and in some degree costume of the individual was accurately given; a fact which is also evidenced by the remarkable sameness visible in all the expressions, varying more than anything else according to periods, in the brasses alike of Ecclesiastics, knights, and civilians. I should mention here that in some cases duplicate brasses have been discovered in which the same person has been commemorated twice or more over, sometimes in different churches, I suppose parishes with which the deceased had been connected; sometimes in the same building; thus we find the effigy of a woman at Childsey, Berks, first in the garb of a civilian's wife, afterwards at Shalston, in that of a nun, thus pourtraying her during the two periods of her life. Again, Ralph Hamsterley, master of University College, Oxford, had three different brasses erected to him in different colleges in that city.

Leaving the *Palimpsest* and duplicate brasses, let us examine for a few moments the actual effigies, or figures themselves, the representations of the persons, whose memory was wished to be handed down to posterity. All brasses fall under three heads: those erected to ecclesiastics, those to military personages, and those to civilians. Let us take them in this order.

First the brasses of ecclesiastics.

All ecclesiastics were interred in full vestments; the effigies therefore which we have remaining are faithful and exact representations of the body, at any rate in costume, over which they were laid, or in commemoration of which they were erected. Priests are the most frequently depicted; rarer, bishops and abbots; still more rare, deacons: an instance of the latter may be seen at Harrow, bearing the date 1468. One of the finest bishop's brasses I know is at New College, Oxford, to Thomas Cranley, Archbishop of Dublin, 1417. It is however with the priests that we need chiefly to deal this evening. These were represented in three distinct classes of vestments.

1. *Eucharistic.* 2. *Processional.* 3. *Academic.* I do not care at present to go into a careful description of the different vestments worn by the priesthood, and depicted on the brasses; the chief and easily recognizable difference however between the first and second classes being that in the first, the priest wears the *chasuble* or large oval shaped vestment, such as you see drawn on the board, in the second, the *cope*, or large sort of cape open in front, and often elaborately embroidered: this latter was worn in processions, during the Magnificat, at the Communion or rather ante-communion office, and on

other solemn occasions such as coronations etc., the chasuble being reserved exclusively for the celebration of the Holy Eucharist. The academical habits are not common, but when found are very easy to recognize without more description. You will see I have drawn roughly some specimens on the board. The brasses of monks and abbesses are very rare: perhaps of the latter there are only two instances, at any rate extent; one at Elstow, Bedfordshire, the other at Denham, Buckinghamshire, both about 1540. Doubtless, this was in great measure owing to the religious orders being bound by such strict rules of poverty, as to prevent their going to the expense of a brass memorial. Sometimes ecclesiastics were commemorated simply by the erection of a brass cross, with or without a lead in the centre, or again by a simple chalice, or other emblem of their profession. These are however rarer, and it is difficult at the present day to know whether there was any real difference between such emblematical representations, and the actual figures of the deceased under a canopy.

Passing from the ecclesiastics we come to the military brasses. These are particularly interesting as showing more variation than the former class in the different stages under which the defensive body-armour of the middle ages on till the end of the 17th century passed in its progressive developements. To point out roughly a few of the more remarkable of these. The earliest military brasses we find represent the figures as clothed in the mail armour so common during the 13th and early 14th centuries throughout Europe; and one distinguishing mark of the effigies of this period is that in nearly all cases the legs are represented as *crossed*. You will see a figure on the board. I think very probably this attitude was given in order, in some degree, to form the sign of the cross. The next style we find, but of which examples are very rare in brasses, shows a slight mixture of the plate armour on the shoulders, legs, and knees, with the older mail. Of all, perhaps, this was the most beautiful kind, if we may judge from the monumental remains. From the middle of the 14th century and downwards we find the introduction of the common plate-armour, which, though it underwent various modifications and changes, never lost its leading characteristics, till the cessation more or less of any such defensive armour at all in the 17th century. With the figures of the knights and other military personages there were also in the generality of cases given those of their wives, sometimes, if they had been married more than once, of their different wives; I have at home a late brass which represents a knight kneeling with his hands clasped in the attitude of prayer and extended to a figure of our Lord rising out of the tomb, while behind him kneel his three wives, the last one having evidently died after her husband, as the inscription in her case is in Latin, of the other two and the man, in English. I may here remark that this attitude of *kneeling* is almost always a sure sign of late brasses, you will scarcely ever find an instance in any specimen of the golden period of the art with the figures in this position; it was I suppose an attempt to give a more free and natural appearance to the figure, but the effect is thoroughly bad and coarse when compared with the solemnity and stateliness of the earlier ages. The man was ordinarily represented as standing on a lion or griffin, as an emblem of his high courage and resolution; beside the *woman* we frequently see the figure of a dog, the type of fidelity and honesty. There is nothing in the art of the Middle Ages more striking than the beauty and appropriateness of their emblematical devices.

I must hurry on just to take a glance at the third order of brasses, viz., those of civilians, perhaps the most generally interesting of all the three, inasmuch as there is more variety visible in costume and idea than in the military effigies, and infinitely more than in those of the ecclesiastics. The brasses of ladies are peculiarly worthy of attention, manifesting the most extraordinary styles of head-gear imaginable. I have drawn one or two just to show what I mean; the vanity of dress was certainly not altogether unknown in those times, and I am afraid we have not much improved on them, at least in that respect. The brasses of children *alone* are not common, indeed I think almost unknown till late in the 16th century. Earlier however we find small *groups* of children, as in the Preshute brass on the board, in which the boys are placed under the father, the girls under the mother.

I have not been able to do more to-night than just point out one or two of the most noticeable facts connected with the study of monumental brasses generally, a study which is so wide, contains so much of detail, and is so difficult to sketch in mere outline, that I feel I have been able to do but scant justice to my subject which, however, I would recommend to the consideration and attention of every member of this Society, more especially to those of the Archæological Section. If I had had more time I should have liked to shew with greater accuracy and clearness the various stages and developments of this branch of art from its rise in the 13th, through its glory in the 14th, and early 15th centuries, till its decay and utter disappearance in the 18th; a disappearance which I hope we shall within a short time be able to say no longer reflects on our good taste and love of artistic beauty; for with the revival generally of æsthetic cultivation we may hail the improvements visible in our sepulchral memorials, and in the attempt, let us trust a successful one, to introduce once again into our churches the long disused brass, if not as yet in all its former splendour of workmanship yet still in a manner not absolutely unworthy of it. But I most not go further at present. Now the subject has been once fairly introduced, and set I hope on some permanent footing in this society, it remains open to anyone to take a portion of its considerable extent, and read you other papers on different divisions of the study—I might suggest on the brasses of this or that county, this or that century, or to take the divisions I made before of ecclesiastical, military, and civilian, and so on. Time so spent I am sure will never be repented, if only we go to work in the true and proper spirit. Every branch of Archæology can teach us much; few branches more than the investigation of the sepulchral remains of a people, who so loved and so honoured their departed friends.

There were 72 persons present—3 Honorary Members, 23 Members, and 46 Visitors.

MEETING HELD OCTOBER 16TH, 1868.

THE following donations were announced, and thanks ordered to be given to the Donors :—

A Quail *(Coturnix vulgaris)*, by G. H. Dawson, Esq.

An egg of the Kentish Plover *(Charadrius Cantianus)*, by A. C. Preston.

Skins of Golden, and White-tailed, Eagles, by the President.

A variety of the Common Linnet called by old Authors the Red-Pole Finch *(F. Cannabina)*, by S. A. Rogers.

Three specimens of the Large Blue (*P. Arion*), by Mr. Nicholls.

A specimen of Dog-tooth Spar, and dorsal vertebræ of a species of Ptychodus, by F. Giles.

A collection of Ferns, by J. B. Oakeley.

A specimen of Queen-shell (*Cytharea Chione)*, covered with Serpulæ, by Mr. Chate.

Figuier's 'Insect World,' by the Rev. G. W. De. Lisle.

EXHIBITIONS.

A Spanish Hoopoe, by E. S. Preston.

A fasciculated branch of a Vegetable Marrow, and a large series of Potato products, by the President.

Some Chinese paintings on Talc, by C. J. Irwin.

G. E. Manisty was elected Secretary, and F. Giles a Member of the Committee, in place of S. Image, who left.

A. C. Blaker was elected an ordinary Member, and G. H. Dawson Esq., and S. Image, Esq., Honorary Members.

E. im Thurn read a paper on the 'Classification of Birds.'

There were 66 persons present: 2 Honorary Members, 24 Members, and 40 Visitors.

MEETING HELD OCTOBER 30TH, 1868.

THE following donations were announced, and thanks ordered to be given to the Donors:—

A skull of a child, showing very clearly the first and second dentition, by J. Walker, Esq., M.D.

A specimen of cement from Stonehenge, by Mr. Baverstock.

EXHIBITIONS.

A specimen of Queen Termite, by E. C. Sewell.

A specimen of petrified wood, also by E. C. Sewell.

A series of Teas, and Tea substitutes, by the President.

E. im Thurn read an interesting paper on his tour in the Engadine.

J. F. Cornish was elected a member of the Society.

There were 38 persons present: 2 Honorary Members, 13 Members, and 23 Visitors.

MEETING HELD NOVEMBER 13TH, 1868.

Some English Coins were presented by Mr. Chivers.

EXHIBITIONS.

H. M. Hilton exhibited some Moths, illustrating brilliancy of colour.

The President exhibited a Stem of Cycas, and an *Ornithorhyncus Paradoxus*; a Cuttle-fish, and a Dog-fish.

E. M. Hall exhibited a Turkish Purse, a Chain made of Grass, and a Seed Pod of *Trapa bicornis.*

H. M. Hilton also exhibited a collection of Shells.

E. Almack exhibited a peculiar Flint from Bucks.

E. C. Sewell then read the following paper, illustrated by diagrams, on

THE ROMAN VILLA OF CHEDWORTH.

THE subject on which I am going to speak to-night may seem rather a singular one to some of my hearers; but living as I do at Cirencester (the ancient Corinium), which is surrounded by Roman Remains, I think it only right to try and give you some idea of the houses in which the Romans, colonized in England, lived.

Before entering into particulars, I must tell you that a great portion of this paper is taken from a report read by a Mr. Scarth on the Villa. The discovery of this Villa was made, singularly enough, by an under game-keeper who was engaged in ferreting for rabbits and came upon some pavement while digging one out. It is situated on a declivity of the Cotteswold Hills, on the estate of the Earl of Eldon, through which runs the river Coln. It is distant from Gloucester 16 miles and 9 from Cirencester. On hearing of the discovery of such a prize on his estate, Lord Eldon gave orders that excavations should be made entirely at his expense, and he not only had careful plans made of the uncovered portions, but he has also had sheds erected over the pavements and a museum built on the spot, to contain the interesting relics which have been brought to light. The walls of the Villa, too, which, owing to the peculiarity of the situation on the slope of a hill, remain to a greater height than usual, have been protected by having copings placed over them formed of the roofing tiles which formerly covered in the Villa. Stoves and the needful apparatus for preserving the floors from frosts, have been placed within the sheds, and every care has been taken to preserve this very interesting monument of the household arrangements of the Roman times from injury by weather or other mischance. Although much has already been brought to light, yet the entire extent of the buildings has not been ascertained, as fresh traces of walls are continually occurring.

The Building seems to have formed three sides of a square, one being much longer than the other two. The portions laid open appear to have been (1) *The Villa Urbana*, which contained the apartments of the proprietor: (2) *The Rustica*, for the farm labourers: and (3) *The Fructuaria*, or store houses, which probably remain to be uncovered. The form of this Villa from its perfect preservation will be found to be very instructive when compared with others. More of it remains than is usually found in Roman sites, and it has been less destroyed, being situated on the declivity of a hill. It will bear comparison with the Villa at Lydney, or the other Roman Villas which have been found in Gloucestershire, as at Stancomb Park, Woodchester, Whitcomb and Withington: and the pavements are in very good preservation and show a high state of art, while one of the subjects is of unusual interest, of which I will speak further on. The finding of at least 257 coins, most of them of the late Roman period, enables us to fix pretty accurately the date of its destruction, and the period during which it was inhabited: while the finding of the *Christian Symbol* Chi and Rho, the first two letters of Christ, cut upon the stones of the building, enables us to fix the building, or repair, or enlargement of the villa at a period subsequent to that of Constantine the Great.

One of these monograms was found under the steps leading from the long corridor into the Villa Urbana and on this account the building is considered by some to have been Christian. A third monogram also has been found on a *metal* stamp. Finding the Christian monogram under the lowest step is certainly a singular fact, but there is no Roman example of the Christian monogram before A.D. 307, (unless the statement of Dr. Rossi be correct, that he found one of an epitaph of A.D. 298). It is to be regretted that only one inscribed stone has yet been found. This bears the letters PRASIATA, which only lead us to regret the loss of the remainder, while it leaves it open to conjecture, whether this building had in any way been connected with the descendant of Prasatagus, the husband of Boadicea. Most probably the name still survived among the Romanised Britons after the time of Constantine the Great. The tesselated pavements are of a flourishing period, and certainly not in the decline of the Roman Power. They bear a close connection with those discovered at Cirencester, and the same artists may have designed and executed the tesselated floors at both places. Cirencester has proved rich in Mosaics, which are well preserved. These pavements are of a very high order of art. Since their discovery, a pavement, treated in a similar manner, has been found on the site of Carthage, and probably belongs to Roman times, when the City was rebuilt and colonised by that people.

Corinium, like Aquæ Solis, seems to have been the centre from which the arts and elegancies of a refined state of society penetrated into the surrounding country. Twenty Roman Villas have been laid open within the radius of a few miles of Bath, and around Cirencester they seem to have been almost as numerous, and similarly round Gloucester. When these cities fell into the hands of the Saxons, the neighbouring villas most probably suffered pillage and destruction. The coins found at Chedworth in the Roman villa correspond in date to those found in the villas excavated round Bath.

Before, however, attempting to unravel the history of this villa, something ought to be said about its plan, as far as it is yet ascertained. In the portion which is regarded as the Villa Urbana, in which are contained the tesselated floors and the bath, there are sixteen chambers and two long corridors. These chambers form two sides of the square, and it seems probable that the buildings have extended yet further East or South East. The principal apartments have faced the east looking up the pretty valley of the Coln. The long corridor and the rooms behind it, in which are the elegant pavements, caught the beams of the rising sun, and must in summer time have been gratefully cool in the evening. In this portion, at the northern end, are the baths, with a flight of steps leading into them out of the corridor. Under these was found the Christian Monogram. The suite consists of three apartments, and the passage with the bath, which together occupy half the space. They do not appear to have communicated with the chambers at the south end of this portion of the villa, which were entered by another flight of steps. The *tesselated floor* at the south end interested me most, on account of its elegant pattern and execution. It seems to contain the figures of a dance eight in number, in which the partners gradually approach and move round each other, till in the last figure the gentleman places a chaplet on the head of the lady. This may be seen in his hand in the first figure.

Unfortunately several of the compartments have been broken up by the burrowing of rabbits. The length of the larger compartment (number 1 in the plan) is 28 ft. 9 in. by 18 ft. 6 in., No. 2, is 13 ft. square, and No. 3 is 14 ft. 6 in. by 18 ft. 6 in. These, no doubt, were the principal living rooms. The sleeping rooms and slaves' apartments seem to have been at right angles to these. The complete Roman Villa seems more to have realised the character of one village, for all the slaves and retainers of the Roman master seem to have their allotted place within his residence, whereas with us each labourer or artizan has his own cottage, and lives apart from his neighbours. In continuation of this line of buildings, facing the east, is that very interesting portion which contains an octagonal basin of pure water, fed from a spring near at hand. The water from the reservoir is conducted into it by a drain. This portion occupies the northern corner of the villa, as far as yet explored, and terminates in a circular apse. It is difficult to say what was the purpose of this chamber. At one end of this, to the left as you enter, was found a stone altar, without any inscription on it, of the usual form, and there are also three small recesses in the wall. Was this altar placed in honour of the deity presiding over the spring? and did the ancient altar remain after the tenant of the villa had become a Christian? The same cool waters which refreshed the Roman and his retainers, now minister to the comfort of the villager or country visitor. Just below this octagonal reservoir, and at right angles to the corridor, which fronts the chambers with tesselated pavement and the bath just described, is a second long corridor which has also been paved with tesseræ, the upper portion of which seems to have been supported on pillars, two of them, about 12 ft. apart, still remaining *in situ*.

At the back of this long corridor is a range of buildings which I have supposed to be the Villa Rustica, or that allotted to the labourers on the farm. This is only a conjecture, because much remains here to be uncovered, and traces of floors and pilæ, as well as baths, appear to be under the surface. These baths, like the others, were approached by steps out of the corridor. To the east of these and behind the corridor, there appears to have been a recess 11 ft. deep and extending about 50 feet. The corridor is paved throughout its whole length, but the pavement is much destroyed. Behind this seem to have stood the baths and washhouses, the mill for grinding, and the floor for drying the corn; and probably also the anvil and the forge, and whatever was needed for the use of a country gentleman's or nobleman's residence. The *Pars Rustica* consisted, first, of a kitchen, which being the general resort of the slaves, must be spacious, and likewise, as a security against fire, should be lofty, and secondly of the slaves' apartments. The slaves who were at liberty, were to have their respective cells looking towards the South, those who were kept chained ought to be provided, for their prison, with a room as healthy as possible, underground, and with numerous but narrow windows, so high above the floor as to be out of reach, at least so says Mr. Daubeney. In Listercomb bottom, in the same parish of Chedworth, were found the remains of the bath or Hypocaust, and the pillars which supported the floor, and the bricks are said to have borne the stamp *Arviri*, in Roman capitals about 3 in. long. There was a spring of water and a cistern to receive the water, and several things are said to have been found and destroyed at the time. One of the bricks was preserved, and this was the only record that remained of what probably was another interesting villa which bordered the banks of the river Coln. When I visited the site of this discovery last year, traces of Roman bricks were still to be seen in the course of the small stream that trickled down the side of the hill. Mr. Lysons says, "It would be worth while to investigate this locality still further. The finding of these bricks with the stamp of "Arvirius" upon them is very interesting, because the name at once reminds us of the British King "Arviragus," as the finding of the name "Prasiata" or "Prasuiti," reminds us of another "Prasutagus," both mentioned by Roman writers."

A pair of small manacles has been found in the Villa of Chedworth, which seem more suited for the hands of a young person than of one grown up. There was also a dwelling near the gate for the Villicus or Bailiff, whose duty it was to look after the slaves. A Roman Villa in Britain was probably not fully and completely provided with all the requisites of Roman hospitality; but as we find the tesselated floors of the living rooms and the baths and corridors, so I have no doubt but that further excavations will reveal the portion denominated "Fructuaria," which received the farm produce. Here was the Granary, the wine press, and wine cellar, but in this villa these may have been united with the villa Rustica, and there appear indications that it was so, but the whole extent of the building towards the east is not yet uncovered.

I think that I have mentioned the word *Hypocaust* more than once in this Paper, and I will now explain it for the benefit of my hearers. A Hypocaust is a place in which heat was generated for conveyance to adjoining rooms. It was not the practise among the Romans to use open Fire Places, as their rooms were floored with tiles, laid on concrete and supported on props. The hot air from the hypocaust was caused to pass between the props beneath the floor. In this way the floor was heated and the room warmed. It had often been a puzzle to know what they did with their smoke. Pliny, however, stated that the smoke, after leaving the chambers under the floor, was carried on into the wood-house and there expended its heat in drying the faggots. The small arched chamber in which the faggots were burned is called the Præfurnium. The method of flues, by which the apartments of this villa were warmed, remains in a very perfect state. We find not only the remains of stoves, but the flues in the wall are perfect to a certain height.

In few Villas can the arrangements of the baths be studied to more advantage, and, as the excavations proceed, we may hope to arrive at a perfect knowledge of the arrangements of a Roman country Villa. Leaden pipes have been found, one of which carried the water from the octagonal reservoir into a small trough 15½ inches long by 13 in. wide, and 9½ in. deep. Ten of the 23 rooms or spaces which have been uncovered are 24 ft. 6 in. long and vary in width from 9 ft. to 24 ft.; one is of a pentagonal shape and underneath it are stone drains large enough to admit a boy. In one room a mass of molten lead was found, weighing 67 lbs. It had evidently poured off the roof of the building into a hollow place, and we thus have a very clear proof that the villa was destroyed by fire. A Lime Kiln also, 9 ft. deep and 10 ft. wide, was found in the wood behind this second portion of the villa, being, as I believe, the only instance which has ever occurred. Just below the reservoir, a forge is supposed to have stood, as three large and very curious pigs of iron were found, of which Professor Buckman has been kind enough to give me the dimensions and weight.

	Length.	*Circumf.*	*Weight.*
No. 1 ...	38 in. ...	26 in. ...	356 lbs.
„ 2 ...	64 in. ...	26 in. ...	484 lbs.
„ 3 ...	39 in. ...	25 in. ...	256 lbs.

Iron implements were very abundant and curious at Chedworth; amongst them were an oyster knife, portions of locks, shears, a pair of lady's curling tongs, and horse-shoes. It is interesting to observe that the horse-shoes were made without the heel flange, which is adopted in the modern horse-shoe, and which veterinary surgeons have pronounced unnecessary. A very beautiful pair of compasses or dividers was also found, so like those that we use in the present day that one can hardly believe that they are nearly 1500 years old. A steelyard with a leaden weight attached to it was also discovered in very good preservation, the nicks on the bar being perfectly clear.

In conclusion, I cannot do better than tell you what the pavement of the Romans is composed of. The green material, of which I have no specimen, and some of that of a lighter colour, was produced from the Lias Limestone. In all probability, the nearest point from which that could be obtained was Fenton in Warwickshire. *The White stone* seemed to be a portion of the great Oolite at Cirencester, which was very compact indeed, and crystalline in its structure. *The yellow stones* were doubtless from some of the more compact beds in the interior of the Oolite district. *The Grey tinted* stones were probably of the same material as the white Oolite, which was found to take a grey tint on being heated. Some of the *black Tesseræ* were undoubtedly pottery.

No glass has been found in the pavements of this Villa, but in one at Cirencester there was some discovered.

To conclude, it is true that the Roman remains found in this country may not be equal to those found on the Continent of Europe, or in Asia, or in Northern Africa, yet the works of Roman Art, and the remains of Roman buildings found in Great Britain, have a particular value to the modern inhabitants of that country: they are a speaking evidence of its past historical importance: they confirm and illustrate its past history; and they form a correct standard by which we can estimate our progress in the arts, or our decline in them, the changes which the lapse of ages has wrought, and the different tastes which at different times have animated the inhabitants of the same island.

There were 47 persons present:—1 hon. member, 20 members, and 26 visitors.

MEETING HELD NOVEMBER 20TH, 1868.

EXHIBITIONS.

Marlborough farthing, Seaman's medal for the capture of Portobello, Crown of Charles II., Half-crown of William and Mary, and other coins, by Rev. J. Sowerby.

A lion's skull, presented by J. Walker, Esq., M.D.

A money bag and cloth made from the palm, and flower of *Bougainville Speciosa,* by the President.

W. Fergus, Esq., M.D., then read a paper, illustrated by numerous diagrams, on "The Tongue."

There were 82 persons present:—3 honorary members, 21 members, and 58 visitors.

MEETING HELD DECEMBER 4TH, 1868.

A collection of Beetles and other insects from Ceylon and Australia; and specimens of Pipe-fish, Hippocampus, etc., were presented by C. W. Elwes, Esq.

EXHIBITIONS.

Two forms of crystals of Carbonate of Lime, by W. G. de Jersey.

Specimens of Echini and Sponges from the Forest Hill, by F. Dobree.

Box of Moths, by H. M. Hilton.

Chameleon, fruit of prickly pear, and gulf-weed *(Sargassum)*, by the President.

W. D. Fenning then read the following paper, on

ENGLISH COINS.

A collection of coins is interesting for several reasons. They show by their execution the amount of care paid to such matters by those who coined them; they also frequently act as a check upon history, rectifying mistakes in dates, and enabling us to determine the geographical position, the political condition, and the nationality of towns of which they are the only remaining traces. By them we are enabled to identify busts and pictures, the heads on them being frequently accurate portraits. As works of art, too, they are valuable, often being very beautiful.

To attempt to give you any account of the origin of coinage and its early history would take more time than we have, and would be far beyond my power. I shall, therefore, restrict myself to the English series, illustrating what I have to say by such of the coins themselves as I am able to obtain either from the Society's collection or other sources. The English series is the most perfect, if not the most artistically or historically interesting of any modern series. It begins before the Saxon Heptarchy and reaches almost without interruption to the present time. We are thus enabled to trace the changes of language during this period, as shown by the legends, while the changes in the titles of the successive kings form an interesting commentary on history, showing the amount of power which the coiners imagined themselves to have.

I shall attempt to give you an account of such coins as from their history or their rarity or other reasons seem most worthy of notice, and then make a few remarks upon the process of coinage and matters connected with it.

Of all coins the one first in use of the existing series is the silver penny, which, with its halves and quarters, was for a long time the only British coin struck. The word itself is derived from the Latin *pendo*, or according to others from *pecunia*, or again from the Gallic *pen*, a head. The earliest known specimen is one struck by Ethelbert, King of Kent, though mention is made of examples of an earlier date. Pennies of most of the kings of the Saxon Heptarchy are found, and from Edgar, who united the greater part of Britain under his control, till the present reign, Edmund Ironsides, Richard I, and John, are the only kings of whom no pennies are found, the series thereby lasting more than a thousand years. There were originally 240 pennies to a pound, giving 24 grains each, but this weight was gradually decreased. Their standard purity seems to have been 10 oz. 2 dwts. fine to 11 dwts. alloy. I can show you no specimens of Saxon coins, and shall therefore say nothing about them. The Normans, otherwise so energetic, made no changes in the actual coins, and for a long time the penny was the only coin in existence here. The obverse has the king's head, generally full face, and differs a little in each reign, especially in the developement of the crown. They are very rudely struck, though other arts, especially that of the goldsmith, seem to have been decidedly flourishing at this period. In the reign of Edward I the head of the king and the general design of the coin first assumed that style which continued without change till the reign of Henry VII. No difference was made to suit the individual likenesses of the respective kings. There was in fact merely a conventional king's head, a full-faced bust, crowned, the crown consisting of the three fleurs-de-lys and two lozenges or balls: with the hair abundant and curled. The whole is enclosed by a circle, surrounded by the king's titles. The obverse bears a plain cross, with three pellets in each angle, and bears the name of the town where it was struck. After Edward III's reign the penny is no longer the only coin. In the 18th year of Henry VII's reign a great reform was effected in the whole coinage, and from his reign onwards the penny changes under almost every monarch. James I's penny, for instance, bears a rose on one side and a thistle on the other. The last penny I have is one of Victoria, but they are too small for use and, I should hardly think, would be used again. The pennies were frequently halved and quartered to act as half-pennies and farthings.

The next coin is the groat, of the value of 4d. It was first struck in the reign of Edward III and is of much the same pattern as the penny. The legend round the outer edge of the obverse is "Posui Deum adjutorem meum." There were also half groats coined, of the same pattern (only smaller) as the groat. The groat is still perpetuated in the 4d. piece; but the half-groat has now been supplanted by the threepenny piece.

The shilling was first coined by Henry VII., in 1593. The term had been used as a "money of account" long before, William I. making the Saxon shilling equal to fourpence, and the Norman one equal to twelve pence, a somewhat curious and one-sided arrangement. It was originally called a testoon from the French tête, a head, from the king's head on it, and the word tester is still used in some parts of the country. It was the first English silver coin which bore the royal arms. I can show you one of Edward VI. In his reign sixpenny and threepenny pieces were first coined of the same pattern. Here is a sixpence of Elizabeth, considerably larger you see than our present sixpence.

The crowns and half-crowns were first coined under Edward VI., in 1551. The series of crowns is, perhaps the most beautiful, and I am sorry I have no more to show you, though I daresay you have all seen some of those last issued, and all have seen half-crowns. The florin, the only other silver coin now used, was not issued of its present value till the present reign, and being one-tenth of a pound may be considered as a step towards the decimal coinage about which there has lately been so much talk. Of silver coins that have been issued and not continued, I can show you a piece of three-halfpence and a piece of three-farthings, both issued by Elizabeth and not before, in spite of Shakspeare, who makes the bastard Faulconbridge in King John, while taunting his legitimate brother (whom he had just before called "a half-face groat," in reference to groats which had just been issued and had the Queen's head in profile) say, after enumerating the other personal defects of his brother—

"My face so thin
That in mine ear I durst not stick a rose
Lest men should say, look where three farthings goes."

alluding to the rose it bore. These small coins, however, were soon withdrawn, though here, you see, is a three half-penny piece issued in the present reign. Edward VI also issued double crowns in silver, but they did not last long. A twenty shilling and a ten shilling piece of silver were coined at Oxford by Charles I during the civil war.

We next come to the gold coins, of which I have not so many specimens to show you. There were only a very few coined by the Saxons. Henry III issued a few gold pieces, worth 1s. 8d., which were called pennies from the resemblance they bore to the silver penny. Edward III was the first to issue a gold coinage of any extent and his may be considered the first real gold coinage.

The first were florins, half-florins, and quarter-florins, the florin being 6s. Its name is derived from a Florentine coin, which, however, it resembled in no way whatever. The florin bore two leopards, the half-florin a mantle bearing the arms of England and France, the quarter-florin a helmet. These were soon re-called and Nobles were issued instead. They gained their name either from their purity and execution or from the nobility, as it were, of the metal. The obverse bears a ship with the King standing in it. It is probably a symbol of the state, and not as Selden, a poet of Henry VI's time, says—

"But King Edward made a siege royall,
And wonne the town and in speciall
The sea was kept, and thereof he was lord;
Thus made he nobles coins of record."

As the King is considerably larger than the ship it is rather hard to imagine how he could have got in. The reverse bears a rich cross, with lions or rather leopards to fill up the vacancies, and has the legend "Jesus autem transiens per medium illorum ibat," said to be the best charm against thieves. The quarter noble, you see, bears the arms of England and France quartered on the obverse, while the reverse is the same as that of the noble, which passed for 6s. 8d. This series in execution and design is extremely beautiful. Edward IV first made the nobles pass for 8s. 4d., and then for 10s., calling them rials, a French corruption of royal. They all bore the sun in the centre of the cross. He also issued angels and half angels, giving them that name from their device, which is the archangel Michael piercing the dragon. On the reverse was a ship, with a cross for a mast, and a shield leaning against it, bearing the royal arms. Henry VII issued double rials, which bore the king in full robes, and were hence called sovereigns. On the reverse is a full blown rose with a heraldic shield in the middle. The spur rials gained their name from the sun in the middle, the rays resembling spurs. Henry VIII issued a George noble which bore St. George and the dragon on the obverse. He also issued crowns and half crowns of gold. In James I's reign the gold coinage was reformed, and the following coins were authorised. First, a 30s. piece, with the king in parliamentary robes; secondly a 15s. piece, with a lion, crowned, holding the sceptre and the shield; and lastly the 10s. piece, the angel, with the old device of Michael, &c. Charles II coined £5 and £2 pieces. In his reign the term guinea was first used, the sovereign being made of gold from Guinea. They fluctuated a good deal in value. The spade guineas of which I have a specimen, were first issued in 1787, and the half-guineas about the same time. You see the shield on the reverse is quite simple and is in the shape of a pointed spade. The seven-shilling pieces, which bear a crown only on the reverse, were issued at the same period. George IV coined double sovereigns. It bears the George and the dragon, which had appeared on the silver crowns of George III, and is most beautifully executed. Here too is a £5 piece of the same reign, lent to me by Mr. Lucy. This too is very nicely executed. He had a short time ago, he tells me, a five-guinea piece of much the same pattern, only a little larger.

We now come to the copper coinage. As copper had been the chief metal for the Roman coins, it is curious that the kingdoms formed after the dissolution of that gigantic empire should have so entirely abandoned the use of that metal for their coins. At first the black or base money of the continent was circulated in England as small change. During the reigns of the Tudors private individuals coined copper tokens, but the monarchs for a long time had a prejudice against a copper coinage, and it was not till Charles II's reign that there was a royal issue. He first issued a few farthings, but this was not enough, and the number of the tokens at length, in 1665, compelled him to issue some half-pence. On the obverse they bear a King's head with the legend "Carolus a Carolo;" and on the reverse Britannia, with the motto "Quatuor maria vindico." The figure of Britannia is said to have been a portrait of the beautiful Frances Stuart, and is very graceful. The farthing bears the legend "Nummorum famulus." Tin coins, or tin with a copper plug in the middle, were issued about the same time. I have here some half-pennies of William III. George I. issued £40,000 worth of copper coins, of which I have a half-penny and a farthing. In spite of this there was a great lack of them in George III's reign, and tokens were again employed till in 1797 Mr. Boulton of Soho, Birmingham, entered into a contract for coining 500 tons of copper. These are the cart-wheel coins, so called from the raised rim round the edge, intended to prevent rubbing. You see I have a two-penny piece and a half-penny; they are well executed. The pennies weighed exactly one ounce, so that if you thought a dealer was using false weights, you could use your own penny instead, but they must have been very awkward for carrying. However, as those who used copper for other purposes preferred melting down these coins to buying new copper, they were soon withdrawn, and the series then issued has lasted with but few alterations till a very few years ago. You all I suppose remember the substitution of bronze for copper, and are probably well acquainted with those now in use.

I have now given you a very imperfect and superficial sketch of the principal coins that have been in use for the last thousand years in this country. There are necessarily some I have omitted and changes in others which it would be tedious to enter into. There are, however, some coins or patterns which, though not issued, are most interesting. I shall mention three. The first is a six-angel piece, struck in the reign of Edward VI. The reverse bears a fine ship of that time (the original type of our late three-deckers), bearing a shield, behind which stands the king in something like due proportion, and other figures in the rigging. In design and execution this is perhaps the finest piece ever struck by the old system of hammering. Another piece is a die, engraved at Oxford by Rawlins for Charles, and is a die of a £5 piece. The king preserved it as one of the last acts of his sovereignty and on the scaffold presented it to Bishop Juxon. The enormous interest attached to this coin as a relic is shown by the fact that a gentleman gave 260 guineas for it at a sale, and his house was besieged by crowds of enthusiastic visitors to see it. It bears the motto "Florent concordia regna," peculiarly inappropriate to Charles' reign. The third is a pattern crown, produced by one Simon at the beginning of Charles II's reign. There was a contest between Simon and a John Rœttin of Antwerp as regards engraving, which was unfairly decided in favour of Rœttin. Simon then engraved a crown, perhaps the best ever issued, with the following petition on the edge: "Thomas Simon most humbly prays your majesty to compare this his tryal piece with the Dutch, and if more truly drawn and embossed, more gracefully ordered, and more accurately engraven, to relieve him." This petition was however not attended to.

The legends around them form, in my opinion, one of the most interesting parts of a collection of coins. In examining them the first thing that strikes us is that they are all Latin; the next, that more than half are religious. As instances of this I may mention on the gold 20s. piece of Charles I, "Exsurgat Deus, dissipentur inimici." This was struck during the war. I have already mentioned those on the groat and on the noble.

The half-angel of Edward IV bears "O crux ave, spes unica." "Redi cuique quod suum est" was put on nearly the basest money ever issued. Those that are not religious generally tell their own tale, as "Rosa sine spinâ," on the coins of Henry VIII: "Carolus a Carolo," on Charles Carolus. "Decus et tutamen," placed round the edge of the coin, as on that 40s. piece, (to prevent clipping) and others. To come to the kings' titles. Athelstane, in 927, was the first to style himself "Rex totius Brittaniæ." The Normans changed this into "Rex Angliæ." After John "Dominus Hiberniæ" was added. Edward III added "Dei gratiâ," which had been used on the seal since the conquest. He also called himself "Rex Franciæ," to which he had some claim. Henry VIII styled himself "Rex Hiberniæ," and James I. added "Scotiæ" and then altered it to "Rex Magnæ Brittaniæ, Hiberniæ, et Franciæ." George I. assumed "Fidei Defensor" and his German titles. You see that on the spade guinea the inscription runs thus—"Georgius Dei Gratiâ Magnæ Britanniæ, Franciæ et Hiberniæ Rex, Fidei Defensor, Brunovicensis et Lunenbergensis Dux, Sacra Romani Imperi Archithesaurus et Elector." George IV dropped the greater part of this, at last relinquishing the empty boast of King of France.

There are a few terms I should like to explain to you. The first is 'sterling.' It is probably derived from 'easterling,' a name given to persons who were appointed in Henry II's reign to make an annual examination of the mint at Easter, so that the term means true money according to the last examination. Another expression is 'Maunday money.' Maunday money is the money given away on Maunday Thursday, or the Thursday before Easter, to as many poor as the queen or king has years. The name probably comes from 'maund,' a basket, in which the doles, originally provisions, &c., were given away. Silver four-pennies, three-pennies, two-pennies, and pennies constitute the Maunday money. Tokens are generally of copper. They are coins issued by private individuals for small change, and are of all shapes and devices.

I shall now say a few words about coinage generally. Till the middle of the 15th century English coins were famous everywhere for purity and fineness. Then they began to decline; Henry VII. debased them from avarice, and Henry VIII to supply his extravagance. Edward VI. did a little towards reforming it, but the real work was left for Elizabeth. She first ordained that all the money should pass for its real value, thereby robbing the country, who only got 2½d. for what they had paid 12d. for. None but a Tudor could have dared on such a bold step. There was then issued a coinage, the real value of which scrupulously corresponded with the nominal rate. Charles did not debase the coinage throughout the civil war. But in William III's reign a great crisis took place. Until the reign of Charles II. the coins were struck by a very old process. The metal was divided by shears, stamped and rounded by hammers. Few pieces were exactly round, and the rims were not marked, so that, though clipping was made high treason, still it prospered. After the restoration the mill was introduced. It is a machine worked by horse power, and was a great improvement, and moreover, as the pieces were round and lettered on the edge, they could not be clipped. These and the hammered coins were in circulation together, and as people were naturally in the habit of melting or sending abroad the new and infinitely more valuable coins, clipping continued to increase. William could not act like Elizabeth, and the distress was very great, especially among the poor who were paid in the old coin according to their supposed value, and had to pay according to their real value. Three goldsmiths were asked to send each £100 of current silver to be weighed. The £300 should have weighed 1200 ozs., but only weighed 624. £100 weighed at Bristol 240 ozs. instead of 400; 203 at Cambridge; 180 at Exeter; and 116 only, at Oxford. A guinea that had been bought by a Quaker for 22s. at Lancaster, increased in value at every stage and was worth 30s. in London. At last the day was fixed, after which the government would receive no more old money.

Great excitement prevailed, but at last, greatly to the joy of every one, the change was happily effected. The coinage then went on smoothly till George III's reign, when, owing to the negligence of the king in not issuing coins, great want was felt, so much so that silver tokens were issued by the banks, and Spanish dollars were stamped and made current. At last, in 1815, the king was compelled to issue a new coinage which was entrusted to Mr. Boulton, who had been so successful with the copper. His machinery was so good that hardly any improvements have been made in it, and it is perhaps the most perfect in the world. Clipping is now unknown. Macaulay tells a good story about the feeling against clipping. A clergyman, preaching before some condemned clippers said, as an aggravation of the crime: If the same question was put now as was put before, "Whose is this image and superscription?" we could not answer the whole question. The image we might guess at, but we cannot tell whose it is by the superscription, for that is all gone." The Irish coinage is chiefly notable for the way in which the English kings debased it, sending everything there that would not have been received here. In execution we have often been behind the continental nations, and especially in variety of designs, though we can boast of some of the best engravers, and our present coinage is decidedly the best. I have now only to thank those who have kindly lent me any coins, especially Mr. Sowerby.

There were 44 persons present:—1 hon. member, 18 members, and 25 visitors.

MEETING HELD DECEMBER 18TH, 1868.

The heads of sections gave their reports for the half-year.

A Chinese visiting card and 7½d. bank-note were presented by R. B. C. Everard, Esq.

Eggs of the Norfolk Plover, Rook (variety), Nightingale, etc., were presented by A. C. Almack, Esq., also a small collection of Fungi by the same.

EXHIBITIONS.

Some Celts from the plain of Marathon by F. Storr, Esq.

An ancient betrothal-ring by F. E. Thompson, Esq. A skull of Cat by E. Almack.

F. GILES then read the following paper on his

TRIP TO AMERICA.

We started from Liverpool, that city of docks and dirt, one fine day in August on board the Cunard packet "Africa," and dropping gently down the Mersey with the tide steamed out into the Irish Sea, past Anglesea, Penguin Island, and Holyhead. The next morning we entered the beautiful harbour of Cork and took on board the mails. On the east side of Cork Harbour stands a round tower which you may remember was taken by the Fenians a short time since while the 'custos' was sipping his tea. This is one of a comparatively small number, still standing in Ireland. The exact date of their erection is, I believe, uncertain, but they bear witness to a considerable amount of mechanical skill among the early Irish. They belong to the transitional period between Roman and Gothic art, and served as belfries, lighthouses, and towers of defence. Their symmetry is perfect; but the courses of rough stones which compose the most ancient of them have evidently owed little to the mason; their very form is probably due to the want of cranes, by which heavy weights might be raised, and skill to bridge a space. Dr. Petrie has conjectured that they were originally isolated bell-towers to churches, which, owing to their inferiority in solidity and completeness of architecture, have long since perished. It may be observed that the isolation of the bell-tower from the church is customary in Russia, not uncommon in Italy, and sometimes met with in England. Leaving Cork Harbour we steamed past Kinsale and Cape Clear and soon lost sight of land. We now began to settle down and choose our friends among our fellow passengers. They were a study in themselves. Our captain was a most excellent seaman and the most polite of men on shore, but as soon as he put his foot on his own deck he became as silent as a stone. Among our fellow-passengers were a Northern family returning from Switzerland, where the sons had been educated, a Nova-Scotian Clergyman, a Scotch doctor, a newly appointed governor going out to his colony, a romantic young couple who were to be married as soon as they reached Halifax, and last but not least old Chief Justice Haliburton, the author of Sam Slick. The excellent old gentleman with any but his intimate friends was as taciturn as the captain himself, but my father knowing him very well, I had the rare pleasure of hearing conversation fraught with such humour as one would expect from the author of Sam Slick. The old gentleman too had the state-cabin opposite us and having a great objection to close air used to amuse me very much by turning out bare-legged in his night-shirt and a most extraordinary nightcap, at about four o'clock every morning, and roundly abusing the stewards for half-stifling us by shutting all the deck windows. He is now dead :—a better hearted man never breathed.

Our passage was exceedingly stormy occupying 14 days instead of the usual 8 or 9. The main deck was generally 2 or 3 inches under water and we actually had some pipe-fish washed on board. When nearing Newfoundland we saw five icebergs, and immediately afterwards entered a dense fog through which we steamed at half speed for 48 hours, with a most doleful steam whistle striking up at intervals of about 2 minutes' duration. This was decidedly unpleasant, for the fog was so thick that we could not see half the length of the deck before us, and if we had run into one of the icebergs we had just seen there would have been an end of the good ship *Africa*, and it would never have been my lot to weary you this evening.

In a paper read to the Natural History Society I may perhaps be allowed to make some digression here in order to give a slight account of the phenomena of icebergs.

Icebergs then are formed in three ways

First, by glaciers decending to the shore and being borne seawards by land winds. These glaciers bear on their surface portions of moraines and blocks of rock, and sand, and mud, enclosed in their sides and which had been carried off by friction from the walls which bounded them. The glacier descends to the sea, huge masses are broken off with their enclosed boulders, and float away as majestic icebergs.

Secondly, by River ice packed during spring, when the upper reaches of the river begin to thaw. In Canadian rivers, for instance, the rivers become solidly frozen over, and if the frost be intense enough, a cake of ice forms at the bottom, enclosing the sand, mud, and rocky fragments strewn over the banks or channel of the stream. When the spring sets in and the upper part of the river begins to thaw, the swollen waters burst their covering of ice and the ice is then said to *pack*. Layer is pushed over layer and mass heaped upon mass, until great floes are formed. These are borne out into the sea by the current and then gradually melt away as they float southwards.

Thirdly, by the freezing of the sea itself. This takes place in the open sea when the temperature falls to 28°, but in inland brackish seas ice forms along the coast. This fringe is broken off by wind or tide, and often returns to the coast, packing over ice which has formed there; the whole mass finally floats out to sea; and icebergs 200 or 300 feet high are sometimes produced in this way.

I cannot give a more vivid description of the appearance of an Iceberg than that contained in the following passage taken from Mr. Geikie's "Story of a Boulder."

He says, "Few sights in nature are more imposing than that of the huge solitary iceberg, as, regardless alike of wind and tide, it steers its course across the face of the deep far from land. Like one of the Frost Giants of Scandinavian Mythology, it issues from the portals armed with great blocks of stone. Proudly it sails on. The waves that dash in foam against its sides shake not the strength of its crystal walls, nor tarnish the sheen of its emerald caves. Sleet and snow, storm and tempest are its congenial elements. Night falls around, and the stars are reflected tremulously from a thousand peaks, and from the green depths of 'Caverns measureless to man.' Dawn again rises, and the slant rays of the rising sun gleam brightly on every projecting crag and pinnacle, as the berg still floats steadily on; yet as it gains more southern latitudes, what could not be accomplished by the united fury of the waves, is slowly effected by the mildness of the climate. The floating island becomes gradually shrouded in mist and spume, streamlets everywhere trickle down its sides, and great crags ever and anon fall with a sullen plunge into the deep. The mass becoming top heavy, reels over, exposing to light rocky fragments still firmly imbedded. These, as the ice around them gives way, are dropped one by one into the ocean, until at last the iceberg itself melts away, the mists are dispelled, and sunshine once more rests upon the dimpled face of the deep. If, however, before the dissipation, the wandering island should be stranded on some coast, desolation and gloom are spread over the country for leagues. The sun is obscured, and the air chilled; the crops will not ripen, and to avoid the horrors of famine the inhabitants are fain to seek some more genial locality until the ice shall have melted away: and months may elapse before they can return again to their villages."

Only about ⅛th of the real bulk of an iceberg is seen above the water, and some have been seen rising 300 ft. above the sea which must therefore, if their submarine portions sank to the maximum depth, have reached the enormous total height of 2700 ft.

Before we emerged from the fog we smelt the peculiar odour of the pine forests and shortly after the mist cleared away and about 20 miles distant we saw the dark green hills of Nova Scotia.

Another couple of hours saw us moored to a wharf in the noble harbour of Halifax and busy getting our traps ready for a landing. We got to an inn as speedily as possible and then began to look about us. The harbour is very spacious and well sheltered. It contains an outer and an inner (known as the Bedford) Basin. This latter basin extends for 10 miles past the city, and both are very deep. The city is built on the slope of a hill on the top of which stands Fort George, called by the Blue noses (Nova Scotians) the Citadel. The houses are mostly of wood, the streets being broad and well laid out. Here are the province buildings of Nova Scotia containing the meeting house of the Legislative Assembly of the province.

We stayed at Halifax for some days and during our walks frequently met groups of Mic-Mac Indians who had their wigwams at the head of the bay. Their queen wore a sort of bag of black cloth open at two of the sides and covered with beads. This I suppose answered to our idea of a crown.

These Indians are in a very miserable state and are fast dying out. In British North America there existed in 1861 about 140,000 of them belonging to nine or ten families. It sounds strangely, but it is a fact that one tribe, the Chippewas, have, or had lately in Canada West, a newspaper of their own, entitled Petubaum, or Peep of Day.

From Halifax we went by rail to Windsor on the Bay of Minas, on which bay Longfellow, it will be remembered, has laid the scene of his Evangeline. Thence we went by coach to Annapolis. Close to this place is Digby the great Station for the smoking of herrings, and whence come, I believe, a very large proportion of our Yarmouth bloaters. We visited one of the smoking huts and saw countless herrings hanging among the rafters, undergoing a gradual smoking process.

We took steamer from Annapolis to St. John, the capital of New Brunswick, and on this boat we for the first time met some real Yankees, the British North Americans being as a rule almost as British as we are ourselves. The people of Canada South are an exception to this. They resemble provincial French. French is the language they speak and even the cautions on the railroad are written in French. These Yankees were very cute fellows, and invested in fish at Annapolis which they intended to sell at a profit in St. John's guessing they would *clar* their passage over by the transaction.

St. John's is a larger city than Halifax, and contains large steam saw mills which cut up the logs floated down the river from the forests on its banks. The city stands at the head of the Bay of Fundy, and one gets a capital idea there of the wonderful rise of the tide in that inlet. Where the river enters the harbour there occurs a vertical wall of rock; large vessels go up the river over it at high water though when the tide is out there is a considerable cascade at this point. The great rise of the tide is due to the currents sweeping up the coast of the States and entering a sort of *cul de sac* between Nova Scotia and New Brunswick. The phenomenon known as the Bore is a wave some feet in height which sweeps up the river flowing into the bay, heralding the advance of the tide and swamping everything it meets in its course. The waters of the bay are of a light yellow colour owing to the enormous quantity of muddy sediment afloat in them; this mud they deposit on the banks of the tributaries of the bay and the farmers cart it away when the tide falls and use it as manure for their land, for which purpose it is found to answer admirably.

At St. John's we took steamer and passing down the bay of Fundy stopped at Portland, got on the Grand Trunk Railway and after a 15 hours' run through Maine, New Hampshire and Vermont we crossed the St. Lawrence by the Victoria Bridge and found ourselves in Montreal.

We did not stop here on this occasion, but, as we made some stay in the place on our way back, it may be as well to give a slight description of it. Montreal, then, is situated on an island of the same name, at the foot of the Royal mountain, from which it takes its name near the confluence of the Ottawa and St. Lawrence Rivers. The city is a fine one, especially remarkable for its lines of quays; it is separated from the St. Lawrence by a broad terrace faced with stone, erected to protect the place from the breaking ice in spring time, which packs in the way previously mentioned into enormous masses, and which, were it not for the terrace would rise above the bank of the river and crush the adjoining houses. The quays are connected with a fine canal called the Lachine canal made to avoid the Lachine rapids just above the city. The city has been much damaged by fire at various times but contains many fine buildings, the most noticeable is perhaps the larger Catholic Cathedral.

The view from the Royal Mount behind the city is very fine. One looks down on the white houses and spires of the town, edged round by a wall of quays and a forest of masts; beyond, runs the broad St. Lawrence its face dotted with small craft, while a long black line running across it marks the Victoria Bridge and the eddying currents and foam above the city indicate the Lachine rapids, down which a long light-coloured body may be seen every now and then to dart, in fact a lumber raft, while still higher up the low Indian village of La Croix catches the eye, and beyond all spreads the flat surface of the country forming the opposite bank.

The Victoria Bridge is perhaps the most magnificent work of its class in the world. It is within a few yards of 2 miles in length. It is tubular and consists of 24 spans the centre one having a width of 330 feet. The whole cost amounted to about 2½ millions sterling. The great difficulty in building it was to provide efficient resistance against the enormous weight of ice coming down the river in spring. This was accomplished by constructing buttresses in the shape of a right angled triangle on the upper side of the bridge, the hypotenuse sloping down into the water.

From Montreal we travelled another 15 hours by the Grand Trunk till we reached Toronto, situate at the west end of Lake Ontario. The scenery along the line between these two places altogether defies description. The railway runs along the northern bank of the broad St. Lawrence for miles and miles. Perhaps the most exquisite piece of scenery on the journey is that afforded by the narrow end of Lake Ontario just were the St. Lawrence flows out of it. This part of the lake is called 'The lake of the Thousand Isles,' and is covered with islets of a most beautiful emerald green colour and ranging in size from 10 miles in length to mere specks upon the water.

Excellent fishing is to be found in the lake, the greatest prize to the fisherman being of course the magnificent sturgeon.

Toronto is nowise remarkable save for its educational institutions and an excellent museum of Natural History belonging to its University.

At Toronto we left the Grand Trunk and taking the Great Western of Canada we skirted the western end of lake Ontario and passing through Hamilton, a favourite Station of army men, at length arrived at the falls of Niagara which we had determined to make the limit of our progress westward.

We heard the dull roar of the Falls (Niagara is an Iroquois word and means Thunder of Waters) from some considerable distance but as we arrived late in the evening, we took a room at the Clifton Hotel, close to the Falls, on the Canadian side, and did not venture out till next morning.

Our first view of the falls was on the whole disappointing, the height is insignificant, only about 160 feet; their enormous breadth and the immense volume of water pouring over them constitute their true grandeur, and these features do not attract the attention at first sight. The more closely they are observed, however, the grander do they appear, until after two or three inspections one goes away convinced that loudly as they are praised, the praise is all too feeble for their magnificence; of the immense volume of water coming over the falls some idea may be formed when we consider that the Niagara River affords an exit for the waters of lakes which cover an area nearly equal to that of one half the fresh water lakes of the world put together.

* The river flows over a flat table land, in a depression of which Lake Erie is situated. Where it issues from the lake it is nearly a mile in width, and 330 feet above Lake Ontario, which is about 30 miles distant. For the first fifteen miles below Lake Erie the surrounding country, comprising Upper Canada on the west, and the State of New York on the east, is almost on a level with its banks, and nowhere more than 30 or 40 feet above them. The river being occasionally interspersed with low wooded islands, and having sometimes a width of three miles, glides along at first with a clear, smooth, and tranquil current, falling only fifteen feet in as many miles, and in this part of its course resembling an arm of Lake Erie. But its character is afterwards changed on approaching the Rapids, where it begins to rush and foam over a rocky and uneven limestone bottom, for the space of nearly a mile, till at length it is thrown down perpendicularly 165 feet at the Falls.

* Lyell's Principles of Geology.

Here the river is divided into two sheets of water by an island, the largest cataract being more than a third of a mile broad, the smaller one naving a breadth of 600 feet. When the water has precipitated itself into an unfathomable pool, it rushes with great velocity down the sloping bottom of a narrow chasm, for a distance of 7 miles. This ravine varies from 300 to 400 yards in width from cliff to cliff; contrasting therefore strongly in its breadth with that of the river above. Its depth is from 200 to 300 feet and it intersects for about 7 miles the table land before described, which terminates suddenly at Queenstown in an escarpment or long line of inland cliff facing Northwards, towards Lake Ontario. The Niagara, on reaching the escarpment and issuing from the gorge, enters the flat country, which is so nearly on a level with Lake Ontario, that there is only a fall of about 4 feet in the seven additional miles between Queenstown and the shores of the lake.

The island dividing the Falls is called Goat Island, and here civilisation exerts its sway for the visitors to the Falls find it an elegant spot for picnics. This island is connected with the American side by a bridge crossing the American falls.

These American falls constitute the smaller of the two cataracts. They are some 5 feet higher than the larger or Canadian falls, but they are far less in width and volume, and do not descend sheer into the river below, but fall on huge boulders of rock heaped up in inextricable confusion at their base.

The Canadian Falls occur between Goat Island and the Canadian Bank of the river. They extend for some little distance from either edge, in a straight line, but near the centre form a horseshoe-shaped curve, the bend pointing up the river. This part of the fall goes by the name of the Horseshoe Fall, and it is from this point that the main body of water is shot clear off the rock into an unfathomable pool below. Clouds of spray several hundred feet high continually envelope the falling water, and when the sunbeams fall on them, the most beautiful rainbows are produced. This spray extends to such a distance that the atmosphere is damp and the wooden palisadings of the fields for some distance round are continually rotting away. It is possible to get behind the extreme edge of the falls on the Canadian side but the ever-falling spray makes the narrow pathway of rock a very insecure foothold and a single false step would send the unwary sight-seeker to another world.

Immediately below the falls on the Canadian bank comes the well-known Table Rock, a crystalline mass formed from the same limestone as that which lines the bed of the river above the falls. Here again irrepressible civilization manifests itself; while looking down at the magnificent Horseshoe Fall, we perhaps hear a voice addressing us and turning round, "*Lo the poor Indian offering his wares.*" If at length overpowered by the grandeur of the spectacle (of the Falls, not the Indian), we turn away in reverie, we run against a sign board directing us to an adjoining bazaar (as conventional a specimen as any in Brighton) where "*polished rock and Indian slippers may be had at all prices!*"

But the falls of Niagara are not only interesting to the sight, seekers, they also afford a magnificent example of the power of rivers, in the excavation of a deep valley out of solid rock. It may be as well to examine them geologically.

* It has long been believed that the Niagara once flowed in a shallow valley across the whole platform, from the present site of the falls to the escarpment called the Queenstown Heights, where it is supposed that the cataract was first situated, and that the river has been slowly eating its way backwards through the rocks for the distance of seven miles.

This view is naturally suggested by the narrowness of the gorge at its termination, and throughout its whole course, as far up as the Falls, above which point the river expands as before mentioned. The boundary cliffs of the ravine are usually perpendicular, and in many places undermined on one side by the impetous stream. The uppermost rock of the table-land at the Falls consists of hard limestone (a member of the Silurian series), about 90 feet thick, beneath which lie soft shales of equal thickness, continually undermined by the action of the spray which rises from the pool into which the water is projected, and is driven violently by gusts of wind against the base of the precipice. In consequence of this action and that of frost, the shale disintegrates and crumbles away, and portions of the incumbent rocks overhang 40 feet, and often, when unsupported, tumble down, so that the Falls do not remain absolutely stationary at the same spot, even for half a century. Accounts have come down to us, from the earliest period of observation, of the frequent destruction of these rocks; and the sudden descent of huge fragments in 1818 and 1828, are said to have shaken the adjacent country like an earthquake. The idea therefore of perpetual and progressive waste is constantly present to us as we look at the falls; and as that part of the chasm, which has been the work of the last 150 years resembles precisely in depth width and character, the rest of the gorge, which extends 7 miles below, it is most natural to infer that the entire ravine has been hollowed out in the same manner, by the recession of the cataract.

Lyell allows 35,000 years for the retreat of the Falls from the escarpment of Queenstown to their present site, calculating the recession to be about one yard a year. But this question of time is a very difficult one as the speed must have varied with the height of the precipice, the hardness of the materials at its base, and the quantity of fallen matter to be removed. At some points it may have receded faster than at present but in general its progress was probably slower, because the cataract, when it began to recede, must have been nearly twice its present height.

* Lyell's Principles of Geology.

I have forgotten to mention the whirlpool; this occurs some distance below the Falls and may be accounted for by the supposition of a barrier of hard rock raising its head from the bottom of the river, in opposition to the water sweeping down from the Falls.

People have speculated on the deluge that might be occasioned by the sudden escape of the waters of Lake Erie, if the ravine should ever be prolonged backwards, but a recent geological survey has shown that the Falls would diminish gradually in height before they had travelled back two miles, and in consequence of a gentle dip of the strata towards the south, the massive limestone now at the top would then be at their base, and would retard, and perhaps put an effectual stop to the excavating process.

The locality is made interesting to engineers by the splendid Buffalo Suspension Bridge which crosses the Niagara about ¾ of a mile below the falls Over the river at this point, and not, as some suppose, over the Falls, Blondin was fool-harday enough to walk on a tight-rope, much to the edification, no doubt, of those who saw him.

We were at the Falls during the American Civil War, and numbers of ruffians had come across the river to escape the conscription; these fellows filled the Clifton House, the hotel at which we were stopping; they had social "liquorings-up" in the evenings, and I think knives were drawn almost every night we were there.

After leaving Niagara we returned to Halifax by the way we had come, save that we went over land from St. John to Halifax and witnessed between these places a most magnificent dense storm cloud rolling down the slopes of the Cobequid mountains; the cloud looked perfectly solid, and was of a brown grey colour; its appearance was most majestic as it came sweeping with resistless might down the mountain side.

At Halifax we stayed some time before embarking, and while there visited the gold mines at Waverley, some 12 miles off. These mines are some of several now worked in the auriferous district of Nova Scotia which extends for 250 miles along the coast and from eight to thirty five miles in land.

This district consists of a metamorphic limestone containing 5 or 6 bands of auriferous quartz running nearly paralled to the Atlantic sea-board of the Province. Each band consists of numerous veins and "leads ?" which vary in thickness from a fraction of an inch to several feet. They are of various degrees of hardness and richness, and at various depths from the surface.

Generally the quartz rock is hard, and yields slowly to abrasion, or the action of frost. In some places the veins are folded and otherwise distorted; in others they follow the windings of the subjacent and overlying rocks. In a few places auriferous drifts, the result of the disintegration of pre-existing quartz veins, and decomposed rocks, afford 'alluvial' or 'placer' diggings, but not, so far as they are known, of sufficient richness and extent to warrant operations on a large scale.

The gold in the quartz bands is not very abundant, one oz. of gold to a ton of quartz, I think the manager at Waverley told us, was the average yield. The quartz is got out by sinking shafts along the course of the vein; the miners descend these and quarry out the quartz in small blocks, which are thrown out at the mouth of the shaft, till the miner in one shaft meets the miner working in the next, a fresh shaft is then sunk further along the line of the vein. The blocks round the mouth are carted away to the crushing mill, where they are thrown into vessels in which work stampers, like the instrument so fatal to shirt buttons in our laundry, but made of iron, and of great weight. These stampers reduce the blocks to sand which is washed over several inclined boards at the ends of which are placed basins of quicksilver; the particles of gold gravitate through the grains of sand and are received in the quicksilver bowls which are, after a time, removed, and the quicksilver is then separated from the gold by straining through wash leather.

Our passage home was a fine one, and we had a good view of the iron-bound coast of Newfoundland.

I cannot quit my subject without directing attention to the extreme natural richness of British North America in almost every respect.

Our geologists and mineralogists would find sufficient occupation for an unlimited number of half-years among its gold, silver, copper, iron ore, galena, plumbago, limestone, and marble. Extensive petroleum wells and lime springs are found. The coal fields are very extensive; perhaps the most curious seam is that of the so-called Albertite coal, formed in Albert county, New Brunswick. It is a bituminous deposit yielding 100 gallons of oil to the crude ton. It will be remembered that it was in the coal fields of Nova Scotia that Sir Charles Lyell and Mr. Dawson confirmed the "growth" theory of coal formation by collecting more direct proofs than had yet been obtained of the growth of the coal plants on the underlying fire-clay. Here, too, Sir Charles Lyell settled the dispute about the atmosphere of the carboniferous deposits, by finding the shell of a small Pupa, an air breather, inside the stem of a tree called a *Sigillaria*.

The Botanist, too, would find in British North America, maples (from which sugar and cabinets are made), birches, (producing the Bark for the Indian's canoe and wigwams, excellent wood for ship building, handling agricultural implements, &c., and a certain instrument of torture we have heard of), oaks and beeches (used in an infinite number of ways), ashes (for making oars and baskets), elms, (for making chair bottoms), butternuts and walnuts, (used for cabinet work), hickories, poplar and willows (used by sleigh and basket-makers), cherry, plum, thorn, strawberry, raspberry, blackberry, cranberry, elder, sumach, sassafras, sycamore, and last but most numerous and most important the various pines, cedars, and spruces.

Among the fauna are bears, wild cats, wolves, red and silver-gray foxes, wolverines, racoons, weasels, moles, bats, martens, otters, cariboo, moose, beavers, porcupines, squirrels, and innumerable birds, the most noticeable being eagles, hawks, owls, woodpeckers, grouse, pigeons, bitterns, snipe, woodcock, and wild ducks and geese.

The fisheries are very important, the most extensive being the cod, mackerel, herring, and shad fisheries. Salmon of large size are found in almost all the Nova Scotian rivers.

I must apologise for having made my digressions on geological subjects alone, a fault which will, I hope, be excused, on the score of my utter ignorance of any other branch of science studied by this society.

It only remains for me to thank you for the attention with which you have listened to a very tedious paper.

After which the Rev. F. W. Farrar, F.R.S., who was a visitor, gave an interesting account of the working of the Harrow Scientific Society of which he is President.

A. C. Almack, Esq. then addressed a few words of advice to the Society.

After which the President having urged upon the Society the immense benefit to be derived from noting down the most ordinary observations connected with Natural History, the meeting was adjourned.

There were 49 persons present: 3 Hon. members, 15 members, and 31 visitors.

ENTOMOLOGY.

Great care has been taken to notice every little thing that may prove of interest to an observer, such as the latest appearance of insects, &c. Full particulars of any important captures will be found in the Notes at the end of the List; also, where thought needful, a comparison has been made between the dates of 1868 and 1867.

As usual, * signifies "new to the Locality."

Names of those whose initials occur in the following list:—

E.G.B.	E. G. Barrow
F.J.C.B.	F. J. C. Boles.
C.M.B.	C. M. Bull, Esq.
J.M.C.	J. M. Chapman.
H.C.	H. Chichester.
C.J.C.	C. J. Cole.
F.M.D.	F. M. Dickson.
J.B.F.	J. B. Fuller.
C.F.H.	C. F. Harrison.
H.G.H.	H. G. Haynes.
A.B.H.	A. B. Hervey.
A.C.H.	A. C. Hilton.
H.M.H.	H. M. Hilton.
F.J.H.J.	F. J. H. Jenkinson.
W.H.M.	W. H. Macdonald, Esq.
G.E.M.	G. E. Manisty.
C.G.H.M.	C. G. H. Mann.
J.B.O.	J. B. Oakeley.
W.J.P.	W. J. Pratt.
A.H.B.R.	A. H. B. Reynardson.
S.A.R.	S. A. Rogers.
H.St.G.R.	H. St. G. Richardson.
H.S.S.	H. S. Sankey.
J.S.	J. Sharp.
F.S.S.	F. S. Shelley.
C.A.S.	C. A. Sladen.
E. im T.	E. im Thurn.
T.J.V.	T. J. Verrall.

RHOPALOCERA.

Gonepteryx Rhamni	Brimstone	Sep. 17 Oct. 11	rather late	J.M.C. J.S.
Colias Edusa	Clouded Yellow ...	Aug. 28	Abundant	J.B.O.,S.A.R. C.M.B.
Lasiommata Ægeria	Speckled Wood ..	Sep 1,10	Very late	H.M.H., A.H.B.R., H.S.S.
Cynthia Cardui ...	Painted Lady ...	Aug. 16	2nd brood	H.M.H.,
		Oct. 31	late ...	A.C.H.,J.M.C.
Vanessa Atalanta ...	Red Admiral ...	Nov. 1	late	
V. Urticæ	Tortoise-Shell ...	Nov. 1	late ...	...H.M.H.
Chrysophanus Phlæas	Small Copper ...	Oct. 20	very late	...H.M.H.
Polyommatus Agestis	Brown Argus ...	Aug. 15	2nd brood	J.B.F.

HETEROCERA.

SPHINGINA

Smerinthus Populi	Poplar Hawk ...	Aug. 26	larva	...C.A.S.
S. Tiliæ	Lime Hawk ...	Aug. 25	do. ...	...A.H.B.R.
Sphinx Convolvuli	Convolvulus Hawk	Aug. 24	Sep. 16	...
S. Ligustri	Privet Hawk ...	Aug. 15	larva	...H.G.H. F.S S.
Deilephila Livornica	Striped Hawk ...	about Sept. 4		
MacroglossaStellatarum	Humming Bird H.	Oct. 24	latest app.	E. im T.

BOMBYCINA

Cossus Ligniperda ...	Goat Moth	Sep. 20	larva	...A.B.H.
LophopteryxCamelina	CoxcombProminent	Aug. 27		A.C.H., H.M.H.
DilobaCæruleocephala	Figure of 8	Aug. 28	bred ...	...C.A.S.
Pygæra Bucephala ...	Buff-tip	Aug. 18	larva	...A.H.B.R.&c
Dasychira Pudibunda	Pale Tussock ...	Sep. 4	larva	...C.F.H.,&c.
Orgyia Antiqua ...	Vapourer	Aug.16	20days earlier	H.M.H., A.C.H.

NOCTUINA.

Acronycta Psi ...	Dagger	Aug. 18	(larva)	...H.M.H.,— A.H.B.R.
A. Megacephala ...		Sep. 18		E.im T.
Leucania Impura ...	Dark Wainscot ...	Aug. 26		F.J.C.B.
*L. Pallens	Wainscot	Sep. 1	very common	F.J.H.J.
*Gortyna Flavago...		Sep. 21		W.H.M.
Heliophobus Popularis	Feathered Gothic	Aug. 17		W.J.P.
Mamestra Brassicæ...	Cabbage Moth ...	Aug. 18		C.J.C.
Caradrina Cubicularis		Aug. 20	common ...	...H.M.H.

*Agrotis Festiva ...		Aug. 19	at light ...	F.J.C.B.
		Sep. 27	latest app.	H.M.H.
A. Suffusa		Aug. 18	8 days earlier	F.J.H.J.
A. Segetum		Aug. 19		A.C.H.,—H.M.H.
Noctua C.-nigrum...		Aug. 26		H.C.
Phlogophora Meticulosa	Angle-shades	Aug. 30		S.A.R.,—G.E.M.
Plusia Chrysitis ...	Burnished Brass...	Sep. 5	late	C.A.S.,—J.M.C.
Amphipyra Tragopogonis	Mouse	Aug. 24		F.J.H.J.
Mania Typica		Sep. 5		W.H.M.
GEOMETRINA				
Ourapteryx Sambucaria	Swallow-tail M...	Aug. 30		C.G.H.M.
Strenia Clathrata ...	Latticed Heath ...	Aug. 20		F.J.H.J.
Minoa Euphorbiata...		Aug. 15	2nd brood	J.B.F.
Ypsipetes Elutata ...		Aug. 19		A.C.H.,—H.M.H.
Melanippe Biriviata...	Dark Carpet ...	Aug. 4	late	H.St.G.R.,—E.G.B.—F.M.D.
M. Fluctuata	Common Carpet...	Aug. 19		F.J.H.J.
Coremia Ferrugaria...		Aug. 19		F.J.H.J.,—H.M.H.
Cidaria Russata ...		Sep. 5	late	T.J.V.
PTEROPHORINA.				
Pterophorus Pterodactylus		Sep. 4		H.M.H.,—H.G.H.
Alucita Polydactyla...		Sep. 23		F.J.H.J.

An attempt has been made to procure a list of Lepidoptera taken at or near Marlborough during the Midsummer Holidays. At present only the following have been obtained:—

Apatura Iris... ...	Purple Emperor	Savernake Forest
Vanessa Antiopa...	Camberwell Beauty ...	In Savernake Forest
Chærocampa Celerio		

These captures in former years have been communicated by Mr. W. J. Baverstock. This year, there have been taken by C. A. Sladen at Alton Barnes,

Hipparchia Semele	Grayling...	July 25.
Pollyommatus Corydon	Chalk-hill Blue	July 16.

Odonestis Potatoria	Drinker	July 3.
Triphæna Janthina		July 18.

Stauropus Fagi	Lobster	June 30.

This last was taken by Mr. J. Velvin in one of the rooms of the College.

August.—When the School returned, the Insects generally noticed at that time could not be found. This can be attributed to the extreme earliness of the Season this year, and to the heavy rain and cold wind, which succeeded the hot and dry Summer. There were, however, some good captures :

(i) *S. Convolvuli*—One specimen taken at Tottenham, Aug. 31, and a second found at rest on a door in the Town, Aug. 25.

(ii) *Agrotis festiva*—Taken at light by F. J. C. Boles. This insect is commonly taken at sugar. It is to be hoped that some arrangements will be made to enable the members of the section to adopt this plan of capturing moths, in which case the List of Noctuæ will be considerably increased.

(iii) *L. Camelina*, taken at Aldbourne by A. C. and H. M. Hilton.

The other captures this month appear in the List. Of *Colias Edusa* it may be remarked that the specimens, though plentiful, occurred only singly, and generally in gardens.

September.—The great capture this month was a specimen of the Striped Hawk (*D. Livornica*), on the 14th.* It was found by two little girls in a stubble-field, near the Railway Station. They took it to a bird-stuffer, who almost entirely spoilt it by cutting off its tail and stuffing the inside with cotton wool, saturated with turpentine. A specimen of this insect, in fine condition, was presented to the Society by F. E. Thompson, Esq. It was captured in Kensington, near London, on 27th August.

A third specimen of *S. Convolvuli* was captured on the Bath Road by a boy in the Town.

L. Pallens was taken for the first time. It is extraordinary that it had never been captured here before by any member of the School.

G. Flavago was also a new addition to our List. It was taken by W. H. Macdonald, Esq.

The Speckled-wood Butterfly (*L. Ægeria*) was observed as late as Sep. 15th by H.M.H. and A.H.B.B. in Manton Copse, and *A Festiva* as late as the 27th. Specimens of the Copper Butterfly (*C. Phlœas*) might have been observed throughout the month.

October.—Not much was done, the weather being very unfavourable. A stray Red Admiral or Painted Lady might be seen occasionally.

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* This specimen may have been taken as early as Aug. 26th.

November.—The last specimens of the Red Admiral and small Tortoiseshell, which were observed this year, were seen on Nov. 1st, that day being unusually hot for this time of year.

December.—A fine specimen of the Peacock Butterfly, apparently fresh from the the Chrysalis, was found on Dec. 6th by S. Featherstone, Esq.

H. M. HILTON,
Head of the Section.

GEOLOGY.

Considerable activity has been evinced by the members of this Section during the past half-year. Meetings have been held fortnightly in the Museum. Attempts have been made to collect information concerning the quarries of the neighbourhood and the fossils to be found in them. Excursions have been made to Oare Hill and the Valley of Rocks, on which occasions Mr. Dixon very kindly explained the denudation of the Pewsey Vale and the theory of the Grey Wethers.

The following papers have been read at the meetings:—

On the Formation of Valleys, by W. E. Mullins, Esq.
On the Mollusca generally, by Rev. J. F. Bright.
On the Gasteropoda, by F. Giles.
On the Cephalopoda, by W. H. Macdonald, Esq.

Members of the section have also classified the fossils in the collection of the Society, the various strata being apportioned as follows:—

To W. E. Mullins, Esq.	The Tertiary Rocks.
„ W. H. Macdonald, Esq. ...	The Oolitic Series.
„ F. Giles	The Cretaceous Series.
„ G. E. Manisty	The Liassic Series.
„ E. Almack and H. J. Verrall	The Carboniferous Series.
„ J. A. Jeffreys	The Silurian Series.

Several exhibitions have been made, at the meetings, of fossils found by members of the section during the half-year; the most important discovery of fossils having been made by W. H. Macdonald, Esq., who came across several cretaceous fish in a quarry near Swindon.

Such is a brief record of the doings of the section, and we cannot close our report without thanking Messrs. Bright, Dixon, Mullins, and Macdonald, for the assistance they were always so ready to offer, and to which it is no exaggeration to say the Section owes its very existence.

F. GILES.

CATALOGUE OF BIRDS IN THE SOCIETY'S COLLECTION.

Kestrel, 1 skin, 2 stuffed.
Sparrow hawk, 2 stuffed.
Marsh Harrier, stuffed.
Hen Harrier, stuffed.
Barn Owl, 1 skin.
Short-eared Owl, 1 stuffed.
Tawny Owl, 1 skin.
Red-backed Shrike, 1 skin.
Night-jar, 2 stuffed.
Missel-Thrush, 2 stuffed.
Fieldfare, 2 stuffed.
Song Thrush, 3 stuffed.
Redwing, 1 stuffed.
Blackbird, 1 skin.
Ring Ouzel, 1 stuffed.
Red-breast, 1 skin.
Brambling, 3 skins.
Chiff-Chaff, 1 skin.
Bluethroated Warbler, 1 skin.
Redstart, 1 skin, 1 stuffed.
Gold crest, 1 skin.
Long-tailed Tit, 1 skin.
Pied Wagtail, 4 stuffed.
Meadow Pipit, 1 stuffed.
Snow Bunting, 1 skin, 1 stuffed.
Chaffinch, 2 skins.
House Sparrow, 2 skins.
Hedge Sparrow, 2 skins.
Bullfinch, 1 skin.
Greenfinch, 1 skin.
Hawfinch, 2 stuffed.
Yellow-hammer, 1 skin, 1 stuffed.
Siskin, 2 stuffed.
Linnet, 1 skin.
Mountain Linnet, 2 skins.
Starling, 2 skins.
Rook, 1 skin, 1 stuffed.
Raven, 1 skin.
Hooded Crow, 2 skins.
Magpie, 2 stuffed.
Jay, 2 skins.
Great spotted Woodpecker, 2 stuffed.
Green Woodpecker, 2 skins, 1 stuffed.
Lapwing, 1 skin.
Wren, 1 skin.
Hoopoe, 1 skin.
Nuthatch, 1 skin, 1 stuffed.
Cuckoo, 1 skin, 1 stuffed.
Bee-eater, 1 stuffed.
Kingfisher, 1 skin, 2 stuffed.
Swallow, 1 stuffed.
Martin, 1 stuffed.
Swift, 1 stuffed.
Pheasant, 4 stuffed.
Red-legged Patridge, 2 stuffed.
Quail, 2 skins, 2 stuffed.
Golden Plover, 1 skin.
Ringed Plover, 2 skins.
Stilted Plover, 1 stuffed.
Peewit, 1 stuffed.
Wood pigeon, 1 skin.
Turnstone, 2 skins.
Oyster Catcher, 1 skin.
Heron, 1 stuffed.
Bittern, 1 stuffed.
Curlew, 1 stuffed.
Redshank, 2 skins.
Common Sandpiper, 1 stuffed.
Ruff, 1 stuffed.
Reeve, 1 stuffed.
Common Snipe, 2 skins.
Jack Snipe, 1 stuffed.
Dunlin, 2 skins.
Purple Sandpiper, 2 skins.
Grey Phalarope, 1 stuffed.
Landrail, 1 skin, 1 stuffed.
Water-rail, 1 stuffed.
Moorhen, 1 skin, 1 stuffed.

Coot, 1 stuffed.
Pintail Duck, 1 stuffed.
Scoter, 2 skins.
Redbreasted Merganser, 2 skins, 1 stuffed
Great Northern Diver, 1 skin.
Common Guillemot, 2 skins.
Black Guillemot, 3 skins.
Puffin, 2 skins.
Razor Bill, 2 skins.
Cormorant, 1 skin.
Arctic Tern, 1 skin.
Common Gull, 1 skin, 1 stuffed.
Herring Gull, 2 skins.
Lesser Black-backed Gull, 2 skins.
Greater Black-backed Gull, 1 skin.
Stormy Petrel, 1 skin, 1 stuffed.
Great spotted Kingfisher, 1 stuffed

95 different species.
88 skins, 67 stuffed.

LIST OF EGGS IN THE SOCIETY'S COLLECTION.

Grasshopper Warbler, 1.
Sedge Warbler, 3.
Reed Warbler, 5.
Nightingale, 4.
Black-cap Warbler, 4.
Garden Warbler, 10.
Robin Redbreast, 9.
Common Whitethroat, 3.
Lesser Whitethroat, 2.
Dartford Warbler, 1.
Blue throated Warbler, 1.
Black Redstart, 1.
Redstart, 5.
Wood Warbler, 7.
Willow Warbler, 10.
Chiff-chaff, 9.
Golden-crested Regulus, 9.
Fire-crested Regulus, 1.
Common Wren, 4.
Wheat-ear, 1.
Whinchat, 1.
Stonechat, 1.
Alpine Accentor, 1.
Hedge Accentor, 6.
Pied Wagtail, 3.
White Wagtail, 1.
Grey Wagtail, 1.
Grey-headed Wagtail, 8.
Ray's Wagtail, 1.
Richard's Pipit, 1.
Rock Pipit, 1.
Meadow Pipit, 3.
Tree Pipit, 2.
Shore Lark, 1.
Skylark, 7.
Crested Lark, 1.
Short-toed Lark, 1.
Great Tit, 23.
Coal Tit, 2.
Blue Tit, 9.
Marsh Tit, 1.
Long-tailed Tit, 6.
Crested Tit, 1.
Bearded Tit, 1.
Yellow Bunting, 5.
Common Bunting, 2.
Black-headed Bunting, 6.
Ortolan Bunting, 3.
Cirl Bunting, 2.
Bullfinch, 5.
Hawfinch, 1.
Greenfinch, 11.
House Sparrow, 9.
Tree Sparrow, 1.
Chaffinch, 5.
Linnet, 11.
Mountain Linnet, 1.
Redpole, 1.
Goldfinch, 1.
Mealy Redpole, 1.
Common Cuckoo, 1.
Green Woodpecker, 1.
Great Spotted Woodpecker, 1.
Lesser Spotted Woodpecker, 1.
Wryneck, 1.
Nuthatch, 1.
Common Creeper, 1.
Kingfisher, 2.
Swallow, 7.
Martin, 3.

Sand Martin, 2.
Common Swift, 2.
Goat Sucker, 2.
Raven, 1.
Carrion Crow, 2.
Rook, 12.
Jackdaw, 9.
Magpie, 6.
Jay, 8.
Golden Oriole, 1.
Starling, 4.
Woodchat Shrike, 1.
Redbacked Shrike, 7.
Spotted Flycatcher, 1.
Pied Flycatcher, 1.
Missel Thrush, 6.
Field-fare, 1.
Song Thrush, 5.
Redwing, 1.
Ring Ouzel, 1.
Blackbird, 8.
Dipper, 1.
Merlin, 2.
Kestrel, 6.
Sparrow-hawk, 8.
Kite, 1.
Common Buzzard, 1.
Hawk Owl, 1.
Tawny Owl, 2.
White Owl, 1.
Short-eared Owl, 1.
Long-eared Owl, 1.
Lapwing, 4.
Common Heron, 1.
Purple Heron, 1.
Common Bittern, 1.
Little Bittern, 1.
Avocet, 1.
Spoon Bill, 1.
Common Curlew, 1.
Dunlin, 1.
Ruff, 3.
Common Redshank, 1.
Wood Sandpiper, 1.
Common Sandpiper, 2.
Black-tailed Godwit, 1.
Common Snipe, 2.
Landrail, 9.
Spotted Crake, 1.
Moorhen, 4.
Common Coot, 8.
Great-crested Grebe, 1.
Little Grebe, 6.
Sandwich Tern, 1.
Common Tern, 1.
Arctic Tern, 1.
Glaucous Gull, 1.
Iceland Gull, 1.
Herring Gull, 1.
Great Blackbacked Gull, 1
Common Gull, 2.
Laughing Gull, 1.
Kittiwake Gull, 1.
Black-headed Gull, 2.
Ring Dove, 4.
Stock Dove, 3.
Rock Dove, 1.
Turtle Dove, 1.
Pheasant, 1.
Capercaillie, 1.
Black Grouse, 1.
Red Grouse, 2.
Ptarmigan, 2.
Rock Ptarmigan, 2.
Partridge, 4.
Red-legged Partridge, 1.
Quail, 4.
Thick-knee, 1.
Oyster Catcher, 3.
Golden Plover, 1.
Storm Petrel, 1.
Gold and Silver Pheasants, 4
Wild Duck, 1.
Eider Duck, 1.
Smew, 1.
Cormorant, 1.
Gannet, 1.
Common Guillemot, 7.
Black Guillemot, 1.
Puffin, 1.
Razor-bill, 3.
Great Auk-model.

456 eggs.
163 species.

ARCHÆOLOGY.

The meetings of this Section have been far from numerous, owing to want of members, but a good deal has been done in the way of exploring by those few. Amongst others the camps at Chisbury and Oldbury have been visited, as well as most of the neighbouring churches and objects of interest. Of the donations to the Section the most interesting are, a large collection of flint implements from Yorkshire by E. C. Scobell, Esq., a Chinese soldier's badge of merit by Mr. Chivers of Marlborough, and a piece of cement from Stonehenge by Mr. Baverstock. The coin collection has been greatly increased. The principal donations are by the Rev. C. Soames, of Mildenhall, the Rev. E. B. Warren, E. C. Sewell, C. E. G. Crawford and others. Three papers have been read in connection with this section; viz. by S. Image on Monumental Brasses, by E. C. Sewell on the Roman Villa at Chedworth, and by W. D. Fenning on English Coins.

COLLECTION OF BRITISH COINS.

SILVER COINS.

Edward I. penny.
Edward III. groat, half-groat.
Henry IV. penny.
Edward VI. shilling.
Elizabeth, shilling, sixpence, three half-pence, three-farthings.
James I. penny.
Charles II. sixpence, twopence.
William and Mary, twopence.
Anne, shilling.
George II. shilling, sixpence.
George III. threepence.
Victoria, twopence, three-half-pence, penny.

COPPER COINS.

Charles II. farthing.
William and Mary, half-penny.
William III. half-penny.
George I. farthing, half-penny.
George II. farthing.
George III. half-penny (1770), twopence, penny (1797), penny, half-penny, (1806).
George IV. half-penny, farthing.
Victoria, penny (1858), farthing, mite.

The Roman and foreign coins are not yet arranged.

BOTANICAL NOTICES.

On our return in August, the country was just recovering from a long and excessive drought, and though a fair number of plants were in flower, it must be observed that very few were in any abundance, many of them occurring only in damp places. During September plants began to recover rapidly and many put forth a second crop of flowers. The weather in October was very cold and wet, consequently many plants were completely killed. Some, however, still continued to put forth a few flowers, and were not entirely killed at the time of our departure in December. The latter half of November was warm, and some few plants came into flower—e.g., Gentiana acaulis, and in December both blue and pink Hepaticas were coming into bloom. Trees generally were leafless after the frosts and high winds in the beginning of November.

I have to thank many members of the School for the great assistance rendered to me in obtaining materials for the subjoined list; some never left their names in my room, but among those who did so I must mention the Rev.

J. Sowerby, W. Mansell, Esq., A. de B. Hovell, S. Shearburn, G. C. Mansel, H. M. Hilton, W. Willimott, E. im Thurn, F. Giles.

In the follwing list, *a* indicates that the plant was observed in flower on Aug. 24, *s* on September 26, *o* on October 1, *n* on Nov. 1, 2, or 12, and *d* on Nov. 26, Dec. 1, or 5. A single letter indicates that only a few flowers were observed, two letters that the plant was commonly in flower, and three letters that it was in full flower. Thus *Sinapis arvensis* was only just in flower during August and September, but was very plentiful during October and November becoming scarce again in December.

Anemone Hepatica	a few in flower December 18.					
Ranunculus acris	a	s	oo	n	d	not observed aft. Dec. 5.
R. repens	a	—	oo	n	—	,, ,, Nov. 2.
Caltha palustris	—	s	o	—	—	single specimens only.
Papaver Rhœas	a	s	—	—	—	rare on both occasions
Fumaria officinalis	a	s	ooo	nn	d	continued in flower all the year.
Nasturtium officinale	a	s	o	—	—	not common.
Cardamine hirsuta	—	s	o	—	—	very scarce.
Alliaria officinalis	—	—	—	n	—	only one specimen.
Sinapis arvensis	a	s	ooo	nnn	d	very scarce on Aug. 24 and Dec. 15.
S. alba	a	s	o	n	—	
Capsella Bursa-pastoris	—	s	oo	nn	d	
Helianthemum vulgare	a	s	—	—	—	very scarce Aug. 24.
Viola sylvatica (b)	—	—	o	—	—	
V. tricolor (arvensis)	a	—	o	—	—	
Polygala vulgaris	a	—	o	—	—	very scarce Oct. 1.
Silene inflata	—	Sep.8	—	—	—	
Lychnis vespertina	—	Sep.8	—	—	—	
L. diurna	—	Sep8	o	(at Devizes).		
Sagina procumbens	—	—	o	—	—	
Stellaria media	—	—	o	nn	d	could not be found in flower before Oct.
S. graminea	—	s	—	—	—	
Cerastium glomeratum	a	s	o	n	d	never plentiful.
Malva moschata	—	—	—	n	d	scarce.
M. sylvestris	—	s	oo	n	d	
M. rotundifolia	—	s	o	n	d	
Hypericum quadrangulum	a	s	o	—	—	
H. perforatum	a	s	—	—	—	very scarce.
H. hirsutum	a	—	—	—	—	ditto
Geranium pratense	—	—	—	n	—	ditto
G. dissectum	a	—	—	—	—	ditto
G. Robertianum	—	s	oo	n	—	

Erodium Cicutarium	—	—	o	—	—	
Linum Catharticum	a	—	—	—	—	very scarce.
Ulex Europæus	—	—	o	n	d	
Lotus Corniculatus	a	s	—	—	—	
Medicago Lupulina	a	—	—	—	—	very scarce
Trifolium pratense	a	s	oo	n	—	
T. arvense	a	—	—	—	—	
T. repens	a	s	o	—	—	
T. procumbens	a	s	—	—	—	
T. minus	a	s	—	—	—	
Vicia Cracca	a	—	—	—	—	
V. sepium	—	—	o	—	—	
Spiræa Ulmaria	a	s	o	n	—	very scarce always
Agrimonia Eupatoria	a	s	o	—	—	
Potentilla anserina	a	—	o	—	—	could not be found in Sept.
P. Tormentilla	—	—	o	—	—	
Rubus (fruticosus)	a	—	o	—	—	
R. cæsius	—	s	oo	n	—	
Geum Urbanum	—	s	o	n	—	
Epilobium hirsutum	aa	—	—	—	—	quite over in Sept.
E. parviflorum	—	s	o	—	—	
Scleranthus annuus	—	s	—	—	—	
Pimpinella Saxifraga	a	s	ooo	nn	d	
Sium angustifolium	a	s	o	—	—	
Æthusa Cynapium	a	s	o	—	—	
Angelica sylvestris	a	s	o	n	—	always scarce
Pastinaca sativa	—	—	o	n	d	ditto
Heracleum sphondylium	a	s	oo	n	—	
Daucus Carota	a	s	—	—	—	
Torilis Anthriscus	a	—	—	—	—	
Scandix Pecten	—	—	—	n	—	
Chærophyllum Temulum	—	s	—	—	—	
Hedera Helix (flower)	—	—	o	—	—	
Cornus sanguinea	—	s	o	n	—	In bud in Sep. and Oct. a second flowering.
Viburnum lantana	—	—	o	—	—	Second flowering,
Lonicera Periclymenum	—	s	o	—	—	
Asperula Cynanchica	a	—	—	—	—	very scarce
Galium Aparine	—	—	—	n	—	
G. Mollugo	a	—	o	—	—	
G. verum	a	s	o	n	—	
Knautia arvensis	a	s	oo	n	d	
Scabiosa succisa	a	—	o	—	—	

S. Columbaria	a	s	o	n	d	
Bellis Perennis	—	s	oo	n	d	all the rest of the year.
Achillea millefolium	aa	ss	ooo	nn	dd	over about the 15th Dec.
Matricaria inodora	a	s	o	n	d	
Gnaphalium uliginosum	—	—	o	—	—	
Senecio vulgaris	aa	ss	ooo	nn	dd	
S. Jacobæa	a	s	ooo	nn	d	
S. aquaticus	a	s	o	n	—	
Centaurea nigra	a	s	o	n	—	a single specimen in Nov.
C. Scabiosa	a	s	o	—	d	„ in Dec.
Carduus Crispus	—	s	o	n	—	
C. lanceolatus	a	—	—	—	—	
C. eriophorus	a	—	—	—	—	
C. arvensis	a	—	o	—	—	very scarce
C. palustris	a	—	o	n	—	
C. acaulis	a	—	—	—	—	
Lapsana communis	a	—	o	—	—	
Pulicaria dysenterica	a	—	—	—	—	
Apargia autumnalis	aa	ss	ooo	nn	d	
A. hispida	—	—	o	—	—	
Helminthia echioides	—	—	o	—	—	
Leontodon Taraxacum	aa	ss	ooo	nn	d	
Sonchus oleraceus	—	—	o	—	—	
S. asper	a	s	o	n	—	
S. arvensis	a	s	—	—	—	
Crepis virens	a	s	o	n	d	
Campanula glomerata	a	—	—	—	—	
C. rotundifolia	a	s	oo	n	—	
Gentiana Amarella	—	s	o	—	—	
G. campestris	a	—	—	—	—	
G. acaulis	—	s	—	n	—	
Convolvulus arvensis	a	—	o	—	—	
C. sepium	aa	s	o	—	—	
Cynoglossum officinale	—	—	o	—	—	
Borago officinalis	a	—	o	n	d	
Symphytum officinale	—	s	o	—	—	
Myosotis palustris	aa	s	o	n	—	
M. arvensis	a	—	o	—	—	
Solanum dulcamara	a	—	—	—	—	
Linaria vulgaris	a	s	oo	—	—	
Scrophularia aquatica	a	s	—	—	—	
Melampyrum pratense	a	—	—	—	—	
Euphrasia officinalis	a	s	o	—	—	

E. odontites	a	s	—	—	—	
Veronica Anagallis	a	—	o	—	—	
V. Beccabunga	a	—	—	—	—	
V. agrestis	—	—	—	n	—	
V. polita	—	s	o	n	d	
V. Buxbaumii	—	s	o	n	d	
Mentha aquatica	a	s	o	—	—	
M. arvensis	—	—	o	—	—	
Thymus Serpyllum	—	—	o	—	—	
Calamintha Clinopodium	a	s	o	—	—	
Prunella vulgaris	a	s	o	—	—	
Lamium amplexicaule	—	—	o	—	d	
L. purpureum	—	s	o	n	d	
L. album	aa	ss	ooo	nn	d	
L. maculatum	—	—	—	—	d	
Galeopsis Ladanum	a	—	—	—	—	
G. Tetrahit	—	—	o	n	—	
Ballota fœtida	a	s	o	—	—	
Stachys betonica	—	—	o	—	—	
S. sylvatica	—	—	o	—	—	
S. palustris	a	—	—	—	—	
Anagallis arvensis	a	s	o	—	—	scarce
Plantago lanceolata	a	s	o	n	—	do.
P. media	a	s	—	—	—	
Chenopoduin album	—	s	o	n	—	
Atriplex patula	a	s	o	—	—	
Rumex conglomeratus	—	s	o	—	—	
R. obtusifoluis	a	s	o	—	—	
R. crispus	a	s	o	n	—	
Polygonum Persicaria	—	—	o	—	—	
P. amphibium	a	—	—	—	—	
P. aviculare	a	s	o	n	d	
P. convolvulus	a	s	o	—	—	
Euphorbia Helioscopia	a	s	o	n	—	
E. Peplus	—	s	o	n	d	
Urtica urens	—	s	o	n	—	
U. dioica	a	s	o	n	—	
Juncus conglomeratus	a	—	—	—	—	
J. glaucus	a	—	—	—	—	
J. lamprocarpus	a	—	—	—	—	
Eleocharis palustris	a	—	—	—	—	
Alisma Plantago	a	—	—	—	—	
Sparganium ramosum	a	—	—	—	—	

Phleum pratense	a	—	—	—	—
Alopecurus geniculatus ...	a	—	—	—	—
Holcus lanatus	a	s	—	—	—
Arrhenatherum Avenaceum	a	s	o	—	—
Poa annua	a	s	o	n	d
Glyceria aquatica	a	s	—	—	—
G. plicata	a	—	o	—	—
Dactylis glomerata	a	s	—	n	—
Festuca gigantea	—	—	—	n	—
F. arundinacea	—	s	—	n	—
Hordeum pratense	a	—	—	—	—
Lolium perenne	a	s	—	n	—
Arundo phragmites	—	s	—	—	—

NEW SPECIES AND LOCALITIES.

Erodium cicutarium	In a field near the Bath Road about a mile from Marlborough. Probably sown with other seed.
Trifolium arvense	Discovered in plenty at Mildenhall by F. Storr, Esq.
Scleranthus annuus	At Mildenhall and on Martinsell.
Helminthia Echioides ...	At Martinsell, found by A. de. B. Hovell.
Festuca arundinacea	At Mildenhall.
Hordeum pratense	At Poulton.

DONATIONS TO THE MUSEUM
DURING THE HALF-YEAR.

Entomology.—Specimen of *A. Lathonia*, from Switzerland, by Rev. A. G. Butler.

A collection of Moths, from A. Marshall, Esq.

A collection of Indian Moths, by C. N. Lawrence.

Pair of *Colias Hyale*, by J. S. Woodhouse.

Pair of Foreign Beetles, by — Fullerton.

Specimen of *S. Convolvuli*, by E. im Thurn.

Two specimens of *S. Convolvuli*, by the President.

Specimen of *D. Livornica*, by F. E. Thompson, Esq.

Three specimens of *P. Arion*, by Mr. Nicholls.

Collection of Foreign Beetles, &c., by C.W.Elwes, Esq., M.D.

Wasp's Nest, 37 inches in circumference, by Dr. Fergus.

Ornithology.—Specimen of Bee-eater, from Spain, by E. S. Preston.

Stuffed specimen of Quail *(Coturnix vulgaris)*, by G. H. Dawson, Esq.

Skins of Golden and White-tailed Eagles (*A. Chrysaetos* and *H. albicilla*) by the President.

Skin of variety of common Linnet (*F. Cannabina*) by S. A. Rogers.

Stuffed specimens of Black-winged Stilt (*H. melanopterus*) and young Stone Curlew (*Æ. crepitans*), by E. im Thurn.

White variety of common Pheasant, by Mr. G. Gauntlett.

Egg of Kentish Plover (*C. cantianus*), by A. C. Preston.

Eggs of Norfolk Plover, &c., by A. C. Almack, Esq.

Botany.—A collection of Ferns, by J. B. Oakeley.

Indian Gourd, by Mr. Hawkins.

Collection of dried Fungi, by A. C. Almack, Esq.

Geology.—A collection of Fossils, by H. S. Sankey.

Fossils from Bognor and Dorsal Vertebræ of *Ptychodus*, by F. Giles.

Mineralogy.—Specimen of Epidote (Zoisite) from St. Gothard, by S. B. Dixon, Esq.

Collection of 24 minerals to complete the representative collection, by the President.

Collection of minerals, by Rev. J. Sowerby.

Specimen of Dog-tooth Spar, by F. Giles.

Archæology.—A large collection of Flint Implements, by E. C. Scobell, Esq.

A collection of 75 coins, by E. C. Sewell.

A collection of 50 coins, by C. E. G. Crawford.

Golden Rupee, by C. F. Harrison.

A collection of 65 Roman Coins, by Rev. C. Soames.

Various coins by H. R. Armstrong, Rev. E. B. Warren, C. J. Irwin, and Mr. Chivers.

Chinese silver Badge of Merit, by Mr. Chivers.

Specimens of Cement from Stonehenge, by Mr. Baverstock.

Rubbings of Monumental Brasses, by S. Image, Esq.

Zoology.—Land Crab, from India, by Mr. Harraway.

Jaw of Young Shark, from Barbadoes, by Mr. Hawkins.

Sponge and two Turtles' heads by Mr. Hawkins.

Queen Shell (*C. Chione*) covered with Serpulæ, by Mr. Chate.

Skull of Child, showing first and second Dentition, by J. Walker, Esq., M.D.

Skeleton of Bull Terrier, and Skulls of Lion and Rabbit by J. Walker, Esq., M.D.

Specimens of Pipe-fish and Hippocampus by C. W. Elwes, Esq, M.D.

Miscellaneous.—Portrait of the President, by Mr. Baverstock.

Chinese Paintings, by C. J. Irwin.

Chinese Bank Note (value 7½d.) and Visiting Card, by R. B. C. Everard, Esq.

Books.—Figuier's "Insect World," by Rev. G. W. De Lisle.

White's "Natural History of Selborne," by F. Madan.

The "Student" and "Popular Science Review" for the half-year, by Rev. J. M. Fuller.

The "Ibis," "Entomologist," and "Entomologist's Monthly Magazine," for the Half-year, by the President.

SALE OF REPORTS.

No. printed... 402

No. sold	330
— given away	56
— in hand	16
	402

* * *

ACCOUNTS.

	£	s.	d.		£	s.	d.
Balance in hand	1	5	10	Photograph of Map in Report	13	6	8
Subscriptions	6	2	0	Printing Report for Mids.	22	0	0
Donations and arrears ...	2	16	0	Cabinets, &c.	9	19	0
Sale of Back Reports ...	0	1	0	Books	0	11	3
——— Report for Mids. ...	41	5	0	Sundries	0	19	11
				Balance in hand	4	13	0
	£51	9	10		£51	9	10

DONATIONS.

	£	s.	d.
A. Armstrong, Esq., ...	0	2	6
F. J. H. Jenkinson	0	1	0
R. Hunter, Esq.	1	1	0
G. H. Dawson, Esq.	0	5	0
Mr. Stubbs	0	10	6
A. C. Almack, Esq.	0	2	6
Rev. J. Sowerby	0	2	6
G. K. Mills, Esq.	0	7	6
Smaller	0	0	6

(Signed) G. E. MANISTY } Auditors.
F. GILES }

MARLBOROUGH :
C. PERKINS, PRINTER, HIGH-STREET.

F. W. Duo

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1869.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
Printed by C. Perkins, Times Office.
1869.

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PREFACE.

WE may once more preface our Half-yearly Report, by stating that the Society has every reason to be satisfied with its progress. Its activity in former directions has not diminished, and it has struck out new lines for itself. The principal novelty of the last half year was the Conversazione. It was thought that the Society had been long enough in existence to justify it in celebrating some sort of public anniversary. Its members were also anxious to acknowledge, to the best of their ability, the great kindness and constant assistance they had received from friends and neighbours, and at the same time to interest a still larger number in the work.

The MASTER and the LIBRARIAN kindly consented to allow the use of the Library for the occasion, while the Bursar undertook to provide for the bodily wants of our guests, and we must add he was as good as his word, and better. The heads of sections displayed the most striking specimens of their several departments; one side of the room was lined with flowers, and what with skins, birds, and butterflies, the library presented a striking contrast to its usual sombre appearance. But we must not omit what seemed to be the centre of attraction,—four binocular microscopes of MR. ROSS, for the loan of which the Society was indebted to the kindness of one of its warmest supporters, DR. WALKER.

To the same gentleman it owes its hearty thanks for an admirable lecture on the human nerves, fully illustrated with diagrams and specimens.

Another stranger, MR. BEESLY, delivered an eloquent account of Dr. KANE's Arctic Expedition. The maps to illustrate the lecture were drawn by D. E. LEIGHTON.

One of the most serious difficulties of the Society has been to provide sufficient pabulum for its fortnightly meetings, and we hope that other strangers will follow the example of MR. BEESLY and DR. WALKER.

The attendance at meetings has been on the whole satisfactory, but it has been subject to considerable fluctuation. We hope that next half it will not only be more regular, but also that the audience will be drawn more and more from the higher and older members of the school. Several of its members we are glad to notice appeared at the head of their forms in the Midsummer examination, a fact of itself sufficient to disprove the prejudice that the pursuit of Natural Science need in any way interfere with school work.

A list of donations to the Society will be found in the Report, but we may especially mention the following:—Coins from H.R.H. Prince Leopold, Mrs. C. W. Tayler, Rev. C. Soames, Rev. H. Bull, and Rev. J. D. Hodgson; pearl mussels from Conway, from Dr. Thurnam; and various donations from W. S. Bambridge, Esq., Sergeant Adams, Mr. Cane, Mr. Piper, Mr. Wooldridge, Mr. Jones, Mr. Parker, Mr. Neate, and Mr. Sawyer. From Old Marlburians, many of whom appear among our list of honorary members, donations from R. B. L. Everard, Esq., and W. W. Fowler, Esq. The Rev. J. M. Fuller still continues to shew his kind interest in the Society, by forwarding the Nos. of the "Popular Science Review," and the "Student," as they are published.

LIST OF MEMBERS.

PRESIDENT:

Rev. T. A. Preston.

SECRETARY:

G. E. Manisty.

TREASURER:

Rev. T. A. Preston.

LIBRARIAN:

E. Almack.

COMMITTEE:

The Ex-officio Members.
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F. Giles.
W. D. Fenning.

HONORARY MEMBERS:

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H. M. Moule, Esq.
W. E. Mullins, Esq.
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C. M. Bull, Esq.
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Rev. J. Sowerby.
Rev. H. Bell.
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W. H. Macdonald, Esq.
F. Storr, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. H. Dumergue, Esq.
R. W. Tayler, Esq.
W. Mansell, Esq.
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W. W. Dayman, Esq.
H. A. Evans, Esq.
Rev. J. W. Mills
C. E. Sewell, Esq.
J. Walker, Esq., M.D.

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A. C. Hilton.
H. M. Hilton.
E. Almack.
J. B. Oakeley.
J. B. Fuller.
M. H. Smith.
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H. C. Spry.
J. H. R. Clark.
G. C. Mansell.
E. Owen.
C. A. Champneys.
E. F. Vicars.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members and Honorary Members.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

Management.

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any member of the Society to take the chair.

Committee.

7.—That on the occurrence of any election, each member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in Editing the Report.

Secretary.

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

Treasurer.

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

Librarian.

14.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

Library.

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Commitee, be allowed to be taken from the room.

16.—That if any member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

19.—That any member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purposes of study, provided there be a reasonable excuse for their not belonging to a section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

Members.

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1s. on Election.

25.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society: to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

Visitors.

26.—That on such occasions when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

Honorary Members.

27.—That Honorary Members have all the privileges of Members, except the power of introducing a member of the School to the meetings of the Society.

Suspension of Members.

28.—That any member be liable to be excluded from the Society by the Committee if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

29.—That sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these sections shall hold meetings as often as shall seem fit to the Heads of the several sections, at which any member of the School with the sanction of the Head of that section, may attend.

Meetings.

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD FEBRUARY 19TH, 1869.

THE following donations were announced, and thanks ordered to be given to Donors:—

Three Spears from the Feejee Islands, Tooth of Asiatic Elephant, Saw of Saw-fish, jaw of Shark, and specimen of Mummy Cloth by Sergeant Adams.

A British specimen of the Spoonbill, and a young Nightingale shot on Overton Downs, by E. F. im Thurn, Esq.

A pair of Cross-bills (*Loxia curvirostra*), by J. B. Oakeley.

A War Club from Abyssinia, by G. E. Manisty.

A Groat of William and Mary, by Mr. C. Perkins.

Collections of minerals by H. C. Spry, H. S. Sankey, Johns, Waldron, and W. D. Mann.

A basket and eggs coated with Carbonate of Lime from the dropping well at Knaresborough, by H. C. Spry.

EXHIBITIONS.

A bowl made of Bitumen from the Dead Sea, by E. Almack.

Specimen of *Dendrobium* in flower, a branch of the curious plant *Coccoloba platyclada*, and a leaf of the Pitcher-plant (*Nepenthes Distillatoria*) by E. F. im Thurn, Esq.

R. W. Taylor, Esq., was elected an Honorary Member.

S. B. Dixon, Esq., jun., then read the following paper on

THE ORIGIN OF SPECIES.

THERE is no subject at the present time of such deep interest to all students of Natural Science as that of the "Origin of Species," nor is there a theory so much misunderstood as the one propounded by Mr. Darwin in his work upon it.

Following close upon this subject, though by no means inseparably connected with it, so far as Mr. Darwin is concerned, is the question whether all animals and plants have descended from some one prototype and this gives still greater interest to it. I purpose in this paper to give as far as I am able a short explanation of Mr. Darwin's theory, and of some of the facts upon which it is based. Before doing so, we must, however, endeavour to understand what is meant by the term species. All organic nature is divided into two *Kingdoms*, the *Animal* and the *Vegetable*. Each of these is again divided into *Sub-Kingdoms*. These again into *Provinces*, the *Provinces* into *Classes*, the *Classes* into *Orders*, 'the' *Orders* into *Families*, and the *Families* into *Genera*. I have here followed the nomenclature of the animal kingdom, but that of the vegetable kingdom would have brought us to somewhat the same point. Where in a genus two groups of animals are separated from each other by constantly recurring characteristics, which are not sexual, no matter how slight and trivial they may be, such characteristics being steadily transmissible by reproduction, then the animals of these two groups would be said to belong to two species. As Professor Huxley says, for the practical naturalist it is a mere question of structural difference. I do not pretend to say for one moment that the definition I have given is not open to objections; in fact it is a matter of very great difficulty to know how the term species can be accurately defined, and no two naturalists will agree upon a definition. I think, however, that the above will be sufficient for our present purpose. I have said that the differences are transmissible by reproduction. Now it is a well known fact and one admitted on all sides that organic matter of every kind has a tendency to vary. The great question therefore is can species so pass and accumulate their variations by inheritance as in the end to bring about specific differences, or in other words to give rise to new species, which have some transmissible variation. That they can do so is what Mr. Darwin contends. To use his own words he says, "I can entertain no doubt that the view which most naturalists entertain and which I formerly entertained, namely, that each species has been independently created is erroneous. I am fully convinced that species are not immutable, but that those belonging to the same genera are lineal descendants of some other and generally extinct species in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore I am convinced that Natural Selection has been the main but not exclusive means of modification." . What is this work performed by Natural Selection? I have already mentioned that amongst all organic beings in a state of nature there is some individual variability. How then do the varieties thus produced, and which may be called incipient species, become converted into good and distinct species? There is incessantly going on in Nature what Mr. Darwin calls a "Struggle for Existence," and we shall best understand the meaning of this expression by taking some familiar instance. Take one single plant and suppose that it shall be on the earth with no opponents, no helpers, and no rivals, and that it requires one foot of land on which to grow. Suppose further that it is a plant that will produce 50 seeds every year, and by the action of wind and currents these seeds shall be equally and gradually distributed over the whole surface of the land. What will happen on this? In the first year the one plant will have increased to 50. In the 2nd year these 50 will have increased to 2500, and so on in geometrical progression that in the 9th year the single plant will have increased to such a degree that there will not be sufficient space on the whole earth to accommodate the descendants. There must therefore be in Nature some principle to counterbalance this great increase of organic life and this is the "Struggle for Existence." All the 50 seeds cannot possibly become plants. Each one is striving against the others. In fact 49 are striving against one, and the result is that the smallest possible start that anyone seed may have, will give it such an advantage as will enable it to get ahead of all the rest. Any variation however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species in its complex relations to other organic beings, will tend to the preservation of that individual. This variation, too, when once started, has a tendency to become hereditary and descend to the offspring. It must be borne in mind that it is not only the preservation of the one seedling that is noticeable, but there is also the destruction of all the other seedlings; therefore anything that causes much destruction also plays a part in the struggle for existence.

These causes are but little understood and no doubt at present not fully appreciated. Many seedlings must be most probably destroyed from germinating in ground too thickly stocked with plants. The amount of food must give a limit to the rate of increase of each species of animals, and climate, as extreme drought or cold, must have a great effect on the destruction of organic life.

These are only a very few of the many causes that play a part in this struggle, but all I wish you to understand is that a such struggle is incessantly taking place in Nature, and that as a consequence of it a great destruction inevitably ensues.

We have now to ascertain how the struggle acts in regard to variation. The reciprocal relations of all organic beings to one another are no doubt most intimate and it is not to be wondered at that whenever a variation arises, no matter how slight it may be, if favourable to the particular individual, it should have a chance of being preserved and propagated, and that if on the other hand a variation arises, at all injurious to the individual, it should assuredly be destroyed. This principle of the preservation of favourable variations and the destruction of injurious ones is what Mr. Darwin calls Natural Selection. I shall explain by and bye that a somewhat similar process is adopted by man and that results are attained somewhat analogous to those produced by

Natural Selection. It may be metaphorically said, bearing in mind what has been mentioned of the struggle for existence, that *Natural Selection* is always on the look out for variation, rejecting that which is bad, preserving that which is good, silently and insensibly working whenever opportunity offers, for the improvement of organic beings in *relation* to their organic and inorganic conditions of life and consequently in most cases to what must be regarded as an advance in organisation. The work may be so slow as to be quite imperceptible and unappreciable, for in no case does the motto "Natura non facit saltum" more strictly apply than it does to the process of variation.

When too a variety has once arisen, there can be no doubt that it again varies, though it may be after a long interval of time and these further varieties, if favourable, are again preserved and so onward. We should also understand that is not only the variations thus inherited that separate descendants from the parent stock, but that there are many laws of correlation of growth in accordance with *which*, when one part of organisation has been altered by successive variations, or by the effects of Natural Selection, and thus become modified, other modifications ensue where we least expect them. Of these laws we know very little, but the facts are plainly observable. The whole organisation appears in fact to be so closely bound up together during its growth and development, that when variations occur, even though they may be but very slight ones, and become accumulated by Natural Selection, other parts become modified. Mr. Darwin gives several most interesting examples of the effects of this correlation of growth and I am sorry I have not time to repeat them. It is of course very difficult indeed for us to watch the effect of Natural Selection with organic beings. The process may be so extremely slow that the effects can be but scarcely visible.

Again the difficulties that arise in thoroughly examining any specimen in a state of nature are by no means slight and we must remember that by removing an organic being from a state of nature to one more favourable for our observation we at once alter its conditions of life and thus preclude an accurate estimation of the work of Natural Selection. An alteration in the conditions of life is often nevertheless the cause of an increased variation. There is however a Selection going on around us that is far more easy to study than Natural Selection, the effects of which even though they may not be so great in the main as those of Natural Selection, are by no means unimportant. This is Man's power of accumulative selection. Nature in the first place gives variation and Man takes advantage of it and uses it to his own purpose. This selection is by no means difficult to study, and its effects are easily traceable in our domestic animals. Take the case of sheep for instance, some agriculturists have so modified the character of their flocks by the principle of selection as to change it altogether. This principle has been carried out by observing differences probably quite inappreciable to one unacquainted with the varieties of sheep and so accumulating the differences in one direction as to produce in the end a sheep of quite different form to the original stock. The same principle is followed by Horticulturists with flowers. One of the many arguments urged against Mr. Darwin's theory is that if the power of the Natural Selection be fully admitted *all* organic beings attained a much higher state of perfection and how is it that there still continue to exist many of the lowest forms of life. In anwer to this it may be replied that Natural Selection does not necessarily imply an universal law of advancement and development but only takes advantage of those variations which are favourable to the individual in its complex relations of life. Unless the individual would be benefited by the development of the variation, Natural Selection would leave it unaltered. In order to realise fully the effect of variation under domestication Mr. Darwin turned his special attention to the study of domestic Pigeons.

The number of different breeds amongst these is very great (somewhere about 150) and the divergences of structure are most striking. Some, as the Pouters, have very long beaks and long legs. Others, as the Fantails, have exceedingly small legs and very small beaks. Others again, as the Tumblers, have still shorter beaks barely deserving the name. There are very many other most characteristic structural differences among the various breeds but I have not time to particularise them. At least 20 Pigeons might be chosen which if shewn to an ornithologist, as wild birds, would certainly be ranked as well defined species and some in fact placed in different genera. Yet Mr. Darwin fully believes this conclusion is generally accepted that all the different varieties of domestic Pigeons have descended from the Rock Pigeon (*Columba livia*). There are certain marks on the tail and wings of the Rock Pigeon which are very constant, and it is remarkable how frequently, in the case of thoroughly well bred birds, these same markings appear. When birds belonging to two distinct breeds are crossed, and neither of them has the particular markings the mongrel offspring is very apt to suddenly acquire them. Mr. Darwin explains this tendency on the principle of reversion to ancestral characters (confined however to colour exclusively), presuming that all the domestic breeds have descended from the Blue Rock Pigeon. Pigeons are generally supposed to have been domesticated for thousands of years and in several quarters of the world, and Mr. Darwin believes that nature having in the first place effected slight variations in individuals when the species was uniform, Man has gone on accumulating these variations by selection so as in the end to produce the numerous true and constant species. We have now to consider in what direction all that has gone before must eventually lead us.

What is the effect of this accumulation of variations aided by Natural Selection. If we grant that variation is hereditary and transmissible how are we to limit the effects that may result from it? Time without stint is all that is wanted for variation and selection to do their work and Geology surely teaches us that as much time may be granted them as the most zealous advocate of the Darwinian theory can desire. We find the first traces of organic life in the Laurentian Rocks of Canada, and what countless ages must have elapsed since those Rocks were formed.

Again the earliest remains of man are found in deposits which geologically speaking, are but of yesterday, yet when we endeavour to fix a date to these deposits, we are almost overwhelmed by their immense antiquity. If we are satisfied that the effect of variation and selection is in the end to produce new species, where are we to stop? It is no doubt startling when we are fully conscious where this admission may lead us. If we allow that specific differences do not preclude the possibility of a common descent, why should generic differences? Nay, the principle being once granted of variation to an indefinite extent, the probality being once accepted that thousands of links in the chain of organic life, from the imperfections of geological record are either lost, or as yet undiscovered, sound induction points to but one explanation of the present divergences, great as they may be, of families, of orders, and of classes. Where indeed can we stop? And what shall we say of Man? He is bound up with the animal creation—their bodily wants and dangers are his also. Every bone in his body has its counterpart in his fellow mammalia. We set aside his non-material attributes, his art, his science, his religion, which if not entirely beyond the domain of physiology, are at any rate upon its extreme and but little trodden verge.

But we most fearlessly face the question, whether the independent organisation of man, with his startling resemblance to the anthropoïd apes should be maintained in the face of the inevitable conclusions drawn from the facts which we have now discussed. Never be induced to repeat the absurd cry that Darwin says that men have sprung from mushrooms or gorillas. He says no such thing, he has only put forth a theory which whether right or wrong does marvellously account for the complex phenomena of organic life in a way that no other theory of the orgin of species has ever done before. The only fear of the true philosopher should be lest he may argue wrongly or from wrong premises; lest he may hastily build upon a theory upon insufficient data. He must not flinch from investigations because they may lead to startling results.

Regarding this difficult question as a Geologist, I cannot help thinking that the succession of life on the earth exhibits a most decided advancement and development, from whatever cause it may have proceeded.

When we regard the earliest form of life that has yet been *found*, the Eozoon Canadense and following upwards see how it has been gradually succeeded by those higher in the scale, the reasonableness of Mr. Darwin's theory *receives* a strong support. The Geological Record, is no doubt, most imperfect so far as our present knowledge is concerned, and no Geologist would ever feel disposed to argue from negative facts in relation to it, yet at the same time the discoveries of the past few years point towards the corroboration of this theory. In one of the paragraphs in the chapter on the "Geological record," speaking of the sudden appearance of groups of allied species in the lowest known fossiliferous strata, Mr. Darwin says "Consequently if my theory be true, it is indisputable that before the lowest Silurian stratum was deposited, long periods elapsed, as long as, or probably far longer, than the whole interval from the Silurian age to the present day; and that during these vast yet quite unknown, periods of time, the world swarmed with living creatures."

This was written before the investigations had been made in the Laurentian Rocks (a vast deposit estimated as upwards of 30,000 feet thick, underlying and of an earlier period than the Silurian Rocks) which have been discovered to be composed of the remains of countless millions of a small Rhizopod, although at the time Mr. Darwin wrote supposed to be unfossiliferous. The day may be very far distant when this theory will be generally accepted as a true one, still I fully believe that the result of future scientific discoveries will tend towards its verification.

The gulf which was formerly supposed to separate the animal and the vegetable kingdoms is slowly but surely narrowing every day, and even of one or two organic beings it is difficult to say with which kingdom they should be classed.

Professor Huxley in a paper recently given at Edinburgh, and published in the *Fortnightly Review*, contends most strongly and with his usual power that the physical basis of life (whatever that may be) is the same with animals and vegetables.

I have endeavoured in this paper to give a short explanation of this difficult and much misunderstood theory, not with the least intention of adding anything in support of it, but in order that you may have some idea of its meaning. As a work "Mr. Darwin's Origin of Species" is one of the finest contributions to Natural Science that has appeared for many years, irrespective of the Theory founded upon it, and I would strongly recommend a careful study of it by any who are desirous of more accurately comprehending Mr. Darwin's Views.

There were 65 persons present, 6 Honorary Members, 20 members, and 39 visitors.

MEETING HELD MARCH 19TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

Some coins and tokens, among which were two golden saxon coins from Cornwall by H. R. H. Prince Leopold.

A collections of coins by Rev. J. D. Hodgson.

A Hornet's nest by J. B. Oakeley.

A collection of Swiss flowers by A. H. B. Reynardson.

A collection of mosses by G. E. Manisty.

Madden's " Roman coins " by W. D. Fenning.

The President exhibited some " Purple of Cassius," used for colouring glass, specimens of Meteoric Iron, Sargassum weed, and a Queen Termite.

W. D. Fenning then read the following paper, written by G. E. Manisty who was absent, on a

VISIT TO ESGAIR.

To the careless thinker it might perhaps seem the easiest thing imaginable to choose a subject on which to read a paper before this Society.—" Oh, it does not matter the least, choose anything you like." That is all very well, no doubt, and it is very comforting to think that one is allowed perfect freedom in selection. But on settling down in earnest to write a paper, any former Utopian ideas are at once dispelled, first one thing is attempted, and then another, until at length it is found that no one subject is thoroughly known, nor sufficiently so to write at any length upon it. The disappointed dreamer then wakes to a sad reality and his only resource is either to work up some subject from books, or else to trust that before long something or other may turn up from his own experience. I have been compelled to follow the latter course. Even now, I have no particular branch of Natural History for my subject, but rather a medley, a little of one thing and a little of another, and not much of any. However, I am emboldened in my present endeavour by others who have trod the same kind of ground before me, and whom I hope not to rival, but to follow as best I may.

As Esgair is only the name of a small estate, I must give you its " local" habitation as nearly as possible. First, then, it is in Wales; secondly it is in Merionethshire: and lastly, it is about two miles from Machynllyth, a town in Montgomeryshire and quite an important place in Wales though it is quite conceivable that you may never have heard of it. I was staying with an uncle and an aunt.

The mode of my arrival was decidedly peculiar and not altogether encouraging. A quarter of a mile of water lay between the station and my final destination. The town of Machynllyth is situated in a valley through which the river Dovey passes, separating the town from Esgair. (The termination of the word Dovey is one form of the Welsh "gwy," water. Its other forms are traceable in Wye, Medway, and other names of rivers). Whenever there has been much rain, this river swells to an unusual extent, in fact over a distance of a quarter of a mile, from the base of the hills, on one side of the valley to the railway embankment on the other. It seemed to me rather an unusual thing to drive through a quarter of a mile of water, and horrible thoughts of watery graves, &c., darted through my brain. My fears however were dispelled by the very matter of fact way in which the horse entered it, which drove me to the conclusion that he had been through it so often before that he had become by second nature an amphibious animal. He struggled patiently through, and I at length reached the other side without even a splashing, although the carriage nearly touched the water very often. Speaking of Machynllyth I may remark for the benefit of the uninitiated, to whom Welsh is generally a great mystery, that though spelt Machynllyth this word is pronounced Mahuncleth.

When I was able to look around me the next morning, I was very much struck with the scenery. As it was about Christmas, of course there were not the varying tints of spring or summer to set it off, but, notwithstanding that, it was, as I have said, striking. The whole country as far as the eye could reach on all sides was a succession of bold hills and deep valleys. The house in which I was lay about 800 ft. above the sea level, and the top of the mountain on which it was built was 2000 ft. In the distance Cader Idris appeared on the North side and the peak of Plynlymmon on the South. The slate which composes all the rocks in that part of Wales presents very strongly marked scenery. Here a mountain rises abruptly two or three thousand feet; here a ravine descends precipitously to a considerable depth below the level of the plain.

I had a very good opportunity of noticing the different planes of what looks like stratification in the slate rocks. Scarcely any were perfectly horizontal, some were more or less inclined, others perpendicular. The layers of cleavage too must vary greatly, for some slates split into minute fragments almost as soon as they are touched, and are therefore useless, whereas in the slate-quarries there are solid blocks more than an inch thick, and several feet in length. Many of the houses in that part of Wales are built entirely of slate, and they present rather a pretty appearance.

The slate naturally is the chief source of wealth in this part of Wales. All day long reports may be heard from the slate quarries caused by the blasting of the rock. These quarries are almost innumerable and certainly rather spoil the appearance of the country. On nearly every hill side you may see large heaps of fragmentary slate which indicate that there either is or has been a quarry close by. It happens sometimes that quarries are commenced in places where the slate is not good, and then they are left just opened. Sometimes they are worked in the open air, and at others under the ground, being entered by a kind of tunnel. I went over one which was werked in the former manner, and it is certainly highly interesting to see the different processes through which the slate passes from the time of its being blasted until it is completed. The whole is accomplished with wonderful rapidity, and the thick slabs are smoothed down and cut up by immensely powerful machinery just as if they were wood. This quarry however, was almost nothing compared to many, especially that of Pehnryn, where upwards of three thousand men are employed. The quarries are of course the chief source of employment for the lower classes, who, by the way, seemed to me to be infinitely superior to the mining population in the coal districts. The quarriers are as a class wonderfully sober, in fact, for the most part, teetotallers; whereas the miners of the more Northern part of Wales are, more often than not, drunkards. Taking the poor generally of the respective districts, around Esgair they are much cleaner and more civilised altogether than their neighbours in Denbighshire. Indeed the women are so industrious that you not unfrequently see them economising their time by knitting as they are walking along. The Welsh element remains stronger in this district than in and about Denbighshire, and many of the old inhabitants do not know a word of English.

The mountains being composed almost entirely of slate are naturally very unproductive. About half way up, they are covered with wood, and at the top with heather or gorse, and sometimes grass. But still the inhabitants contrive to turn their high land to some account. The tops of the mountains are generally covered with sheep, and, as I before said, lower down trees are grown. I noticed that all the woods were composed of young trees (oaks for the most part). On enquiry, I was told that it is usual to cut down these diminutive forests about every thirty years and to plant young ones in their place. The branches are sold for fire wood (and strange to say are as dear as coal), and the trunks as timber. By these means it is found that the trees yield more profit than they could be made to do in any other way.

My first thoughts on arriving at this delightful spot were how to do something or other for the Natural History Society. I was told that an incredible number of *mosses* were to be found in the neighbourhood, and therefore, though no Botanist, I determined to get as many varieties of these as I could. The pursuit had all the attractions of novelty and of change of scenery. I need not tell you that some mosses only grow on high hills, and there you must go to get them, while others again only grow in valleys, into which you must descend to get *them*. Certainly it would be difficult to imagine any spot more favourable for variety of mosses than the neighbourhood of Esgair, for there is such variety of dry and damp, of high and low. At the foot of nearly every hill the slate rocks are saturated with water which is constantly trickling down, unless the weather is very dry. One of the prettiest features of the country is the countless number of little rills and diminutive torrents which come sparkling and dashing down over the steep rocks. Some of them really seem to be almost perpendicular as you look up at them from below, and you wonder how it is that they do not leave the surface of the rocks and dash in a volume through the air. I could hardly bring myself to believe it when I was told that there were trout in many of the less steep streams. However, I was converted to *this* creed during my stay by seeing a trout pulled out of a small ditch, you might almost call it, not more than 5 or 6 feet wide. What was still more incredible was to be told that there are *salmon* in such shallow steep streams. This too however I at length learned to believe; a spot in such a stream was pointed out to me by a gentlemen who told me that two seasons before he had there shot a salmon, mistaking its dark back for an otter. It was not until the under shining scales turned up, that he discovered his mistake. I can quite fancy a salmon getting over a wear, knowing from a paper on the subject last year by G. H. Dawson, Esq., that they have immense powers of springing; but I was not prepared to fancy their ascending these endless wears; for many of these streams are such, both in steepness and rapidity. It was long believed, in fact, from time immemorial, by the inhabitants that in a stream of the nature which I have been describing a famous robber had once had his cave. Last summer, however, a gentleman in the neighbourhood thought that he would examine the place and see if there was any probability of the truth of this legend, He went accordingly one day, prepared for a dip, as the water was very deep, and managed to get close up to the spot where the cave was said to be. All doubt as to the truth of the report was completely removed; there was no cave at all. I saw the place myself, and it certainly *did* look as if there was a hole in the rock. The water descended in a fall over an almost sheer rock, and at the bottom of this was a deep hole, that is to say 9 or 10 feet deep. Of course the rock at such a depth, with the water running over it looked very dark, and had a cavern-like appearance. Though the stream was so deep at this one part, it was not more than six feet wide, and in most places hardly a foot deep.

But to return to where we were when this digression arose. I was speaking of the variety of mosses and the variety of habitation for them. There are some species which grow almost in the water, at least never anywhere but in damp places. Such is the 'Bog moss,' so called because it is found in bogs or moist ground of some kind. The very appearance of this variety shows its nature and habits, for it is a very pale green, almost white, just if all the colour had been washed out by the constant influence of water. Many Lichens, too, are to be found even in the beds of rivers, on any projecting rock. These species of Lichen are very easy to procure, that is to say, some of the common kinds, but it is very hard, in fact, almost impossible, to press them so as to keep their natural appearance. While growing, they are saturated with moisture, and when that is driven out by the process of drying and pressing, the leaf shrivels up and loses its bright colour. Other mosses, for the most part the commonest, seem to thrive almost anywhere, regardless of dry or damp, as long as there is a sprinkling of soil for their roots. Some of the 'Fork-mosses' are of this nature. The great Botanist, Mr. Bloxam, had paid a visit to Esgair previously to my going there, and he said that he had never in England or abroad found such variety both of mosses and lichens as he found there. There is one moss which seems only to grow at a considerable elevation, for it is only to be found on the highest mountain near Esgair, namely, Arran-y-gesil. This is the Fir Club Moss, a peculiar species very like a fir-tree and very unlike most other mosses. As I devoted nearly a day to procuring a specimen of it I shall venture to make another digression. Arran-y-gesil is, I believe, about the sixth highest mountain in North Wales, being nearly 4000 ft. high. It stands at the end of a valley, the two sides of which are formed by two 'arms' of the mountain itself, forming what is very like a gigantic arm-chair. I rather fancy, indeed, that the name Arran-y-gesil denotes the "giant's arm-chair," but I am not certain and therefore will not make a positive statement of it. One day after having beaten a considerable portion of the valley leading up to Arran in the hope of rousing a few woodcocks and having failed most signally in the attempt, I was enticed by the imposing appearance of the mountain to reach the top, and from it to obtain a view of the surrounding country. The task seemed a very easy one when we started, but the further we went, the further we seemed to have still to go. At length, after a great deal of panting and blowing (for a gun and ammunition are not any great aid in climbing a steep mountain), the summit was reached. There was a great change of atmosphere at once perceptible. At the foot of the mountain it had been mild and even oppressive. Now, on the contrary there was a cold wind blowing which was very acceptable after the exertion of climbing. There was snow on one side of the mountain, although it was so very mild in the valley. I was only too glad to take some as a cooling draught, and indeed I really believe that without it I could hardly have gone any further. I looked over the inside of the back of the arm-chair, so to speak, i. e. the side facing down the valley, and it certainly looked very forbidding. It descends almost perpendicularly to the very base, and would be certain death to any one so unfortunate as to slip over the edge, for there is no grass nor anything of the kind on it, but merely bare jutting rocks. On the very top of the mountain I found the wished-for Fir Club Moss, and also some Stag's-horn which is something of the same kind. (Both these mosses belong to the same family, the Club Moss Family, of the Natural Order 'Lycopodiaceæ.') At first there was an impenetrable cloud of mist which seemed to be coming *out of* the mountain rather than *on to* it. This soon cleared off, however, as if for our special benefit, and we obtained some of the most lovely glimpses of scenery that I have ever beheld. It was a cloudy day, but here and there the sun shone through the clouds, and the effect of light and shade was most perfect. I was surprised to see a hare get up on the very top of the mountain, (so surprised indeed that I let it get out of shot before it entered my head that I might shoot it), for it is not common to see them on such high ground. The only other live creatures which I saw were a grouse and two very large hawks. I was told that in the breeding season this is a very favourite resort of grouse, of which as many as fifty may sometimes be seen together.

Standing upon the summit of Arran, I could gather a general idea of the mountain and valley system in the neighbourhood. What struck me at once was the regular direction of the various small chains, which run parallel to each other and at right angles to a common central range. Again, many of the mountains present a rounded and smoothed character instead of the uneven and jagged nature visible in many regions. These two facts, the regular direction of the hills and valleys, and the smooth appearance of the former point to a glacial agency. That is to say, at some distant period, incredible as it may appear to some, North Wales was traversed by a regular system of glaciers. This will account both for the parallel course of the mountains and for their smoothness. The former is probably to be explained as follows. Glaciers, as you may be aware, follow very much the rules of rivers, and I need hardly say generally have one common high ground in which they rise, called the watershed. Thus, in England, most of the large rivers rise in the more elevated land in the West and flow down to the coast on the East. It was so too, probably, with the glaciers of North Wales. They had their origin in a high district and all flowed down from that place, thus running in the same direction more or less and forming the parallel valleys which we now see there. In many places there are traces of the moraines, or heaps of stones, formed by these ancient glaciers, just like those which the glaciers in Switzerland are now forming. As for the second phenomenon, the rounded nature of the hills, glacial agency is the only power which will account for it, and it is to be seen wherever glaciers have been at work. The rocks are also often scratched by the stones which are rolled along between the ice and the bottom and sides of the bed of the glacier. As I said before, it may startle those who have never studied Geology to hear that there were ever glaciers in Wales, and it is but natural that they should be incredulous. It is a fact however which cannot well be contested, just like many other facts which at first appear impossible. It cannot be denied that the greatest changes of atmosphere have taken place in these islands at some very distant date. A few facts may perhaps prove this to you. There have been found in a fossil state the bones of the Elephant, Hyæna, and such animals, which we know could not live in a climate like that which we now have in England. Again, trees are found embedded in some of the rocks in England which now only grow in a tropical climate, as, for instance, species of palm, huge tree ferns and the like. What is more, these are sometimes found in the very position in which they once grew, so that it cannot be said that they were carried by the sea from some tropical country and deposited here. There are quite as strong proofs to show that there was once an extremely cold climate in Britain as well as a very hot one. The nature of the mountains and the scratches on the rocks, which I have just mentioned are very strong evidence and what perhaps may seem still stronger to you is that there are fossil shells found in England and Wales just like those which now exist only in Arctic seas. I think you may now feel more willing to credit the statement that North Wales was once covered with glaciers as Iceland is at the present day. There is another feature of Wales which probably is connected with this glacial action, and that is the frequent occurrence of small lakes. Professor Ramsay some time ago enuntiated a theory which certainly has probability to support it and explains what is otherwise inexplicable. His theory, briefly, is that sometimes glaciers which once formed their moraines where they ended in valleys, afterwards retired further and further owing to some changes in the temperature, while the moraines remained as they were and found a dam. When the ice was succeeded by running water with the increasing warmth of climate, this water had no outflow, and the result was *a lake.* You must please to excuse this rather long digression as it is Natural History to some extent, *i.è.*, it is to account for some of the natural appearances of the county, and it may interest some, though not all.

As for hawks, I never saw so many anywhere else, as round Esgair. In general they literally swarm ; and must, there is no doubt, do great injury to the game. The neighbourhood seems to be a resort of every kind of 'vermin,' for not only are there innumerable hawks but also innumerable magpies, jays, &c., &c. There is one animal which is shot unmercifully by the gamekeepers whenever it is seen, and that is, what they call there a Pole-cat. How far this appellation may be correct, I cannot say, but the animal was described to me (for I had not the good fortune to see one myself) as yellow and black, and much larger than a stoat, with a bushy tail. I was very anxious to shoot one or to get one by some means for our Museum, but did not succeed, as they were not to be found on our side of the valley, though not uncommon on the other. Owls, too, though hardly 'vermin,' perhaps, are very numerous there, both the white and the brown species. Never having been accustomed to hear these peculiar birds in the night, I was quite startled on the first night of my visit at Esgair. I could have declared just at first that it was some children screaming at the top of their voices, but on listening I was undeceived. There was one owl hooting somewhere close to my window, and several others answering him in various directions, for the house was surrounded by woods. I grew rather fond of listening to them after a short time, and tried to catch, their note exactly, I certainly could not distinguish the "tu-whit, tu-whoo," of our poets, although I tried to make myself believe that that was the real call. There seemed to be no break in the middle of the hoot, but that it was continuous. It sounded something like tu-whoo-oo-oo-oo, the last note being higher than the rest, and all being piercing and shrill. Perhaps it is partly the cry of the owl, and partly its silent flitting motion, which is certainly rather ghost-like, that causes it to be dreaded as a bird of ill omen among the poor in many places. The weather was exceedingly mild during my visit, as through most of last holidays, and to this fact I was greatly indebted for being able to prosecute my botanical searches, (if they may by a figure of speech be so called), for the mosses were in perfection. As an instance of this mildness, roses in the open air were in full bloom, and we even discovered a solitary blackberry, which would no doubt have been shrivelled up and withered long before, had it been an ordinary winter. Even the denizens of the interior of the earth seemed aware of the unusual warmth, for the moles had begun to work their way up towards the hills. It is a singular fact but one which you may see taking place that these animals every winter retire to the valleys and remain there until spring when they sally forth and return to the high ground. I suppose that this is done because it is warmer in the valleys in the winter and more easy for the moles to burrow and to find worms, &c., to live upon. They had already advanced a considerable way up the side of the hill on which Esgair lies when I was there, and that was in January. I do not mean to lay it down as a Natural History fact that moles *always* seek the lower lands in winter and return to the higher in spring. But, at the same time, as this is the case at one place, it is quite allowable to suppose that it is so generally.

But everything must have an end, and so had my visit. I got into the train, and was lost in a reverie until I noticed that the hills were gradually getting lower and lower, the valleys wider and wider, and at length I found that I had left the Esgair seenery behind, and was near my own habitation.

I cannot conclude this wearisome subject without mentioning that it was my uncle to whom I was indebted for the Abyssinian panoply of club, bow, and arrows, which you now see suspended on these walls. He also gave me a peculiar article of furniture in vogue among Abyssinian women, which I unfortunately left behind. This is a rest for the head, something like a Lilliputian bench, lower in the middle than at the ends. The ladies of Abyssinia wear very long hair, or rather I should say they take extreme care of it, and as they wear it in a mass, or a chignon, at the back of the head, they cannot conveniently lie down without great injury to the said mass. They therefore solve the difficulty by resting the neck on these little benches, so that the hair is kept off the ground or whatever it may be that they are reposing upon. I hope that I shall still be able to give this curiosity to the Society some time or other.

I shall be most happy to present the collection of mosses to the Society if they will accept it. I quite intended to name them all from the collection which I have said Mr. Bloxham had made. I found, however, that it took such a very long time to identify each species when there are so many almost the same, that most of them are left unnamed. Some Botanist will perhaps think it worth his while to do what I could not accomplish. There are some lichens also in the collection, but I was not so fortunate in them as in the mosses. There are about fifty varieties of them in the neighbourhood of Esgair, but I think I have only about twelve. Most probably it will be found that I have pressed more than one specimen of the same moss occasionally, for which and for all other errors I must beg forgiveness, hoping that the will may be taken for the deed.

You will hardly think it necessary for me, I am afraid, to apologize for not having given you a longer paper, but I may perhaps just remark that in a short visit to a place only a few hours distance there cannot be so much to see and talk about as a trip to America for instance, or to some other distant part of the world, and therefore the confined limits of the subject must be my excuse.

There were 27 persons present: 2 Hon. Members, 10 Members, and 15 Visitors.

MEETING HELD MARCH 5TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors :—

A collection of Geological specimens, by Mr. Piper.

A very interesting Collection of Curiosites from the first North Polar expedition, by Mr. Sawyer.

An Abyssinian Bow and Arrows, by G. E. Manisty.

A set of Maunday Money of Charles I, by Mrs. C. W. Tayler.

A Saxon Penny, coined at Cunetia, the ancient Marlborough, by Rev. W. H. Bell.

A Chinese Coin, and a Medal to commemorate the victory of the Duke of Cumberland in 1721, by — Smythies.

EXHIBITIONS.

A box of moths, by H. M. Hilton.

A lump of Silica from the ashes of a wheat stack, by the President.

H. M. Hilton then read a paper on the Classification of Moths and Butterflies.

H. Manders, H. Soames, and W. D. Harvey were removed from the list of members, in default of payment of subscriptions.

W. Mansell, Esq., Rev. G. W. De Lisle, and Messrs. R. F. Isaacson, W. Koch, G. T. Spankie, W. W. Dayman, and H. A. Evans were elected Honorary Members.

R. Rocke and D. E. Leighton were elected Ordinary Members.

There were 33 persons present: 3 Hon. Members, 13 Members, and 17 Visitors.

MEETING HELD MARCH 13TH, 1869.

THIS was a private meeting to consider the motion of H. J. Verrall, that "Notices of Sectional Meetings be posted on the board outside Mr. Preston's Room." The motion was seconded by W. D. Fenning, and carried without opposition. A discussion about the better working of the sections succeeded.

MEETING HELD APRIL 2ND, 1869.

There were no exhibitions, in order that there might be more time for the following paper, which was read by A. H. Beesly, Esq., on

THREE ARCTIC EXPEDITIONS.

THE pretensions of this paper are very humble. I propose to tell you something of the objects of Arctic expeditions generally, to give you some idea of what the Arctic regions are like, and to summarise the history of three expeditions—those of Barendz, De Haven, and Kane. And let me give a hint to officers of House Libraries who may be present: if you want books of thrilling interest, books the authors of which were the actors in their own dramas, books which admit their readers to the glorious fellowship of the Knights Errant of Modern Times, let me recommend you to buy all the narratives of Polar Expeditions you can lay your hands on.

You must go back a long time with me—nearly three centuries—to the first great Arctic expedition. Its date is 1594. Many of you know something of the state of the world at that time. Elizabeth was on the throne of England, Henry of Navarre was on the throne of France, Philip II was drawing near the end of his infamous reign. If you wanted to fix the century that was closing in your minds you might do so in many ways: it was the century of the Reformation; it was the century of the greatness of Spain; it was the century of the Armada and St. Bartholomew; it was the century of the first Russian Czar, of the foundation of the Mogul Empire in India, and of the maximum splendour of the Ottoman Empire; it was the century of Loyola and the century of Luther; and, what is more to our purpose, it was the century of the rise of Holland. Philip II had had three great objects in life, one was to conquer England, another to force Catholicism on the Netherlands, another to create an universal empire in Spain. He ruined the Spanish navy by the first attempt, he ruined the Spanish army by the second, he ruined Spain by the third. He had only one quality worthy of his age, the vastness of his projects. For perhaps nothing is so characteristic, after all, of that century, as the immensity of the schemes formed and the results obtained, compared with the insignificance of the resources at man's disposal.

Men's minds were fired by the splendours of the dawn of their era. What was there too wild to hope, too visionary to dream, when Gama had found a new way to India, Columbus had discovered a new world, Magellan had found a passage through that world, which men till his time thought extended in one unbroken continent to the South Pole? And Philip, the most powerful King of Christendom, had his dream too, a wicked dream which so mean a mind as his could never have conceived at any other period. I have said how he failed on all sides, and perhaps what wounded his bigoted soul most deeply was his failure to crush Holland.

If the Reformation was the most striking feature of the rise of religious freedom, modern political freedom may be said almost to date from the rise of Holland.

And now I have come by a somewhat roundabout way to my proper subject. But unless you understood something of the spirit of the time, you really could not understand the spirit of the first great Arctic expedition. Imagine a nation sprung full armed to freedom as Minerva sprang from the head of Jove. Imagine it in the first flush of its youth, and strength, and enterprise—a new nation in a new world.—A nation which had its home upon the waters; which while it fought Philip desperately by land, was preparing to fight him triumphantly by sea, sending forth its mariners far and wide to hitherto unknown oceans to wrest their commerce from the Spaniards and Portuguese.

And a world which was constantly being added to. The discovery of a new country in those days was little more than an improvement in the telegraph or the steam engine or gunnery in this. Talk of steam engines and Atlantic Cables! What are such surprises to the stirring hopes that fired our forefathers. If we find means of speaking to our friends over the Atlantic, they found out what the other side of the Atlantic was, and not a captain who sailed westwards but hoped he too might be another Columbus, and discover some new country and an unknown race.

And now you will not be surprised to hear that the leading projectors of the first great Arctic expedition were grave statesmen, philosophers, and merchants, headed by the leading statesman of his country, Olden Barnveld. Such men were actuated not only by speculation and ambition, but patriotism. For the whole ocean south of Spain was then a Spanish lake, the private property of Spain just as much as the Mediterranean had been of Rome at the height of her power. To poach on these preserves entailed a double danger. If the Dutch sailor was caught by the Spaniards he was at once handed over to the Inquisition. And moreover he knew nothing of the Indian or Pacific oceans; the Spaniards alone had practical acquaintance with those seas. Hitherto the Hollanders had traded with the east through Spain, soon they were to force their way into this great private lake, and make those oceans the common highway of the world. But just at the close of Philip II's reign they were compelled to renounce the carrying trade with Spain, and they had not yet found out that they could perform the whole voyage for themselves.

What then was more natural in such an age than that they should determine to find a new way to the golden countries of the East? Geography was then flourishing in Holland: Mercator was a native of Leyden, and his great maps were published at Amsterdam. Another ardent geographer was Peter Plancius of Amsterdam. There was plenty of science to stimulate discovery,—there were plenty of brave seamen ready for any venture,—there were plenty of rich merchants to back any venture with their purses. The Spaniards locked up the whole south ocean. Well, said these Hollanders, we will go across the *North Pole* to Cathay. There you have the origin of Arctic Expeditions; It was exactly the same idea which Cabot had entertained nearly a century before when he tried to find a passage N.W.,—and when we think of the disinterested chivalrous ideas connected with the name in our minds, ideas which in our age have filled the souls of men who would have been Knights Templars or Hospitallers in the Crusading age, and knights of the Round Table in the age of legend, we can hardly imagine that they first dawned in the minds of sober commercial citizens.

But so it was. Republican commerce has always gone hand in hand with patriotism and daring; and commercial Holland was the pioneer in the path which has since been trodden by so many noble Englishmen and Americans, whose deeds have given the lie to Burke's lamentation, that the age of chivalry is dead.

And now that the expedition was resolved on, who were to be its leaders? What was to be its course?

Cathay is a name loosely used and sometimes means the northern part of China, sometimes Ceylon, the Spice Islands, and India generally—what in fact is meant by the expression "farthest Ind." These Dutchmen believed that they could save 10,000 miles by sailing north instead of going round by the Cape of Good Hope. There were no maps, you must remember, of the unknown regions beyond the northern headlands of Sweden. Plancius, Prince Maurice, Olden Barnveld, and others thought that the way to Cathay was north east. In this view they were supported by the greatest traveller of the time, a Dutchman named Linschoten. But though they were all agreed so far, there was a difference of opinion; one party was for sailing between Nova Zembla and the coast of Muscovy, which they said would be found to trend in a S.E. direction, and so reach Cathay. Plancius and others, and among them the brave Barendz, wished to sail north of Nova Zembla leaving it on the east. Some said that four great straits would be found on the coast of Muscovy communicating with the Arctic seas. Others said that in those seas round the pole reigned perpetual summer, and that a race of virtuous and happy beings dwelt there. Others peopled it with monsters with hoofs of horses and dogs' heads, and with no clothing but their own long ears which they coiled round their limbs and bodies; and it was considered pretty certain that a race of men with no heads, and eyes in their breasts, were the wisest of their tribes. You know how Shakespeare has in two of his plays alluded to such notions. These races it was believed lived in eternal fog and tempest, and died all of them every winter, to spring up again like vegetables next year. Volcanoes of fire, and mountains of ice would daunt the voyagers, but in time they would find the happy haven, and discover the golden glories of Cathay.

Amid such prognostications Barendz and Linshoten set out in June 1596, not in steamers of iron with perfect mathematical instruments, portable soups, patent stoves, extracts of meats, &c., but without coffee or any tea, in ships of a hundred tons burthen, built up like a tower at stem and stern, bulging out clumsily amidships, with the roughest kind of fireams, the rudest of implements, and the coarsest of food. They were rich only in one thing, they drank no ardent spirits, and the absence of this served them in as good stead as the presence of many luxuries—it kept them in health and it kept them from mutiny. So prepared they set out for unknown seas and realms of fable, to grapple with beast, or monster, or storm. They set out in June, they were back again in September. Barendz had sailed to lat. 77, to the extreme N.E. of Nova Zembla, which was then mapped out for the first time. He had been nearly wrecked and had fearful encounters with walruses which they had never before seen. Linschoten went about 150 miles north of the Waigatz where he was stopped by ice.

Not a very encouraging result this you will think! Linschoten and the States General thought otherwise. So glowing was the picture painted by Linschoten that it was supposed that the highway to Cathay was found. The very next year another expedition was sent out equipped — how do you suppose? With preparations for the perils of the frost or the ice, or those *monsters with almost human faces, as large as an ox, and with two terrible tusks? Nothing of the sort. It went laden with tapestries, linen, and broadcloth, for sale in Cathay, and a yacht went with it to sail back with the tidings when the few merchantmen had fairly turned south round Muscovy.

Alas for this sublime credulity! The only discovery made was on Staten Island where they landed to pick up what they described as "a kind of diamond very plentiful on the island." While two of them were thus engaged one felt himself twitched behind it. "What are you pulling at me for mate?" he said. The next moment his head was off, and his supposed mate, a long lean white bear, was sucking his blood. Twenty of his companions charged the bear, which however killed another of them, and half ate him during the fight.

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*Monstra maris ambiguas hominum ac beluarum formas. Tac; An; II. 24.

They managed to kill him at last with a snaphance, (how the very name shows their poor equipment) and with the skin and the Staten diamonds they came home, for the ice stopped all further advance.

The States General were bitterly disappointed, but they offered 25,000 florins to whoever should discover the North Passage.

The very next year Barendz set out again, he had two brave comrades, John Cornelius Van der Ryp and Heemskerk, on whose tombstone is this inscription: "The man who ever steered his way through ice or iron."

They sailed on the 18th of May, N.E. by N. On the 15th of June they saw immense flocks of white swans, as they thought, swimming towards the ships; the swans turned out to be icebergs. In two days more they came to water green as grass, so thought they were near Greenland.—On the 9th of June they discovered an island, where they had a great fight with a polar bear, and called it Bear Island.—On the 21st of June, they arrived in 80th degree of latitude, and called the land which was covered by eternal snow and mighty glaciers, by the appropriate name, "Spitzbergen." Here they made an interesting discovery: rowing up a wide inlet they found myriads of the geese which visit Holland in summer, sitting on their eggs. This dissipated the hitherto prevalent belief that these geese were hatched from eggs which grew on the trees in Scotland. The diarist of the expedition says, quite gravely, "we now see that quite the contrary is the case." They were driven south by the ice again and once more reached Bear Island on July 1st. Here they parted company; Cornelius Ryp sailed north again; Barendz for the N.E. of Nova Zembla. They came to anchor off an inlet, where they had erected a cross in the preceding voyage. Here, as if in mockery, they saw two great polar bears standing on their hind legs beneath the cross. The boatmen were running off, but Heemskerk said, "the first man that runs shall have this boathook of mine," so they slowly retreated, Heemskerk bringing up the rear.

On the 15th of August they reached the isles of Orange, extreme N.E. of Nova Zembla, and seeing nothing but open sea were full of joy, the first who saw it pulling fast back to ship not knowing how to get quick enough to tell William Barendz. They knew nothing of what I shall presently speak about, the influence of the Gulf Stream. The ice soon stopped their progress eastward and all that August they remained struggling with it, the ship sometimes rearing in the air, her bows propped up by large blocks till she actually sat erect on her stern, then heeling over on her side and anon righting again as the ice floated off. All the while a blinding snow storm raged, the ice cracking and groaning, the ship creaking, the wind howling, till, said the Diarist "it was enough to make the hair stand on end."

The ice was here, the ice was there,
The ice was all around:
It cracked and growled, and reared and howled,
Like noises in a swound!

By the month of September the strife was over. They were ice-bound on the shores of Nova Zembla. Cheerfully they set about preparations for the winter. Luckily they found plenty of driftwood with which they built huts, and brought stores from the ships. For six weeks they laboured amid a hurricane of wind and snow, and tormented by bears. They could not leave a meal-tub for a moment without a bear's muzzle rummaging its recesses, and sometimes they had to run for their lives, throwing sticks and stones at their pursuers who stopped to play with them like dogs with children. They killed one, disembowelled him and stuck him up near the house on his legs where he was frozen and snowed upon till he became of monstrous proportions, a bear of ice. The carpenter died before the house was built and they could dig no hole to bury him, so they laid him in a cleft of the ice where the snow soon covered his body. On the 12th of October the house was done, and they had a house-warming, setting up a gigantic icicle for the May pole which it was their national custom on such occasions to rear in front of the house. The first night they slept there a bear took possession of the ship. On November 4th the sun rose no more.

You know what the appearance of the sun is in those regions.

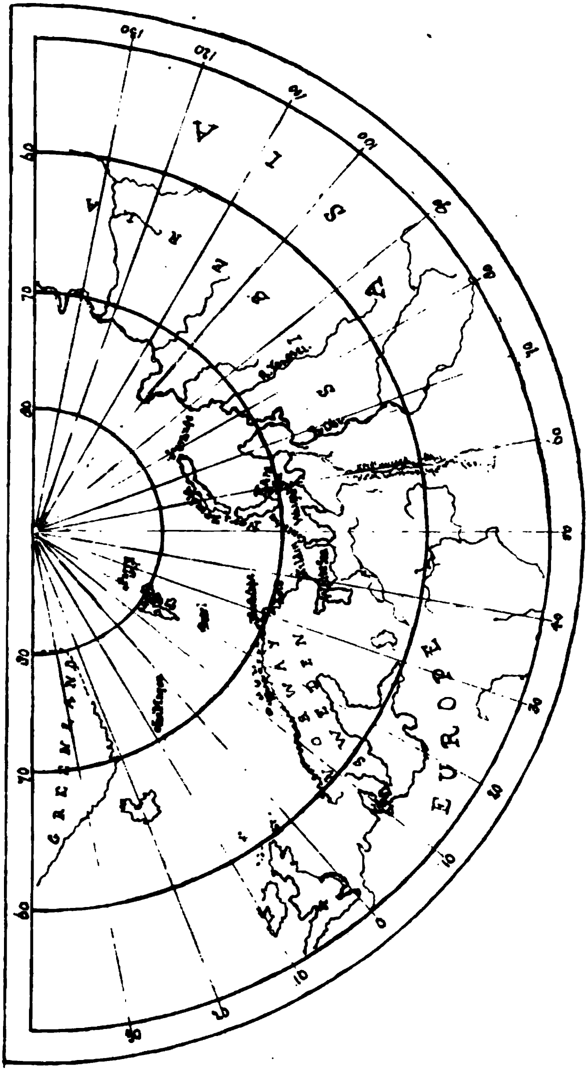
To a person at the North Pole the sun appears to sweep horizontally around the sky every twenty-four hours, without any perceptible variation during its circuit in its distance from the horizon. On the 21st of June it is 23 deg. 38 min. above the horizon—a little more than one fourth of the distance to the zenith, the highest point that it ever reaches. From this altitude it slowly descends, its track being represented by a spiral or screw with a very fine thread, and in the course of three months it worms its way down to the horizon which it reaches on the 23rd of September. On this day it slowly sweeps around the sky, with its face half hidden below the icy sea. It still continues to descend, and after it has entirely disappeared it is still so near the horizon that it carries a bright twilight around the heavens in its daily circuit. As the sun sinks lower and lower, this twilight gradually grows fainter, till it fades away. On the 20th of December the sun is 23 deg. 38 min. below the horizon, and this is the midnight of the dark winter of the pole. From this date the sun begins to ascend, and, after a time, his return is heralded by a faint dawn, which circles slowly around the horizon, completing its circuit every twenty-four hours. This dawn grows gradually brighter, and on the 20th of March the peaks of ice are gilded with the first level rays of the six months' day. The bringer of this long day contines to wind his spiral way upward, till he reaches his highest place on the 21st of June, and his annual course is completed.

With the sun the bears went, but white foxes came, which they caught in traps and ate, dressing themselves in their skins.

The cold now became appalling. Their clothes froze. Their shoes became like iron. The clocks stopped. The beer became solid. The wine had to be melted in saucepans. The smoke blinded them. Fire would not warm them. The snow fell all December. They could scarcely dig themselves a way out of the house. They shut up the chimney one night and were nearly stifled to death. Glad enought they were that one had strength enough to let in their kind enemy the cold air. On twelfth night they had a feast, a little wine, 2lbs. of flour made into pancakes with oil, and one biscuit per man, which they sopped in the wine. "We were as happy," says the diarist, "as at a splendid banquet at home. We imagined ourselves in the fatherland with all our friends." The Gunner was proclaimed monarch of Nova Zembla for the night.

On the 24th of January they saw the sun again, but though the long dark night was over, the cold was as bad as ever, and the bears came back. Three of them fed on bear's liver and were nearly poisoned. Spring came, but it was spring only in name. Another of their number died. They hollowed out a grave in the frozen snow and sung a psalm over him, but before they had done they were nearly all frozen to death. On the 14th of June they deserted the icebound ships, and set off in two boats, Heemskerk in one, Barendz in the other. Barendz was ever hopeful. On the 20th June, rowing in an open boat on that awful polar sea, he was too weak to sit up, but lay studying the charts he had made, and prattled how in his next voyage (his next voyage Heaven save the mark!), he would steer N.E. from the North Cape, and so on. Then the boatswain of the other boat told him that Claus Andersen could hold out only a little longer. Then said William Barendz, "Methinks I too shall last but a little while. Give me to drink." He drank, turned his eyes on his friends, and died.

In sore dismay at the loss of one on whom, to use the diarist's words, "they had counted next to God," his comrades struggled on. They had by this time again doubled the N.E. of Nova Zembla, and were sailing southwards and on the 27th they doubled Cape Nassau. All east of that point is named Barendz Land, and it has never been entered from that time to this day. On the 1st of July one of the boats foundered. On the 27th they had reached Kostin Shar; and on the 18th of August, Candenoes (Kanin Nos) at the mouth of the White Sea. Crossing the sea they reached Kildin. On the 25th one of the party set out with some Laps to look for some ships which they were told were up the river at Kola. On the 29th the guide came with a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letter from a man who promised to come with food immediately. He signed himself John Cornelius Ryp.

They all fell to wondering who this Ryp could be, and strangely enough never guessed it could be the same man who had parted company with them at Bear Island, who had only gone northwards as far as Spitzbergen again, had then gone home, and was now on a trading voyage at Kola. The story of this voyage is over.—On the 1st of November, Barendz's men stood before the magistrates of Amsterdam in their robes of white fox skin, having been absent 17 months, having penetrated 80 degrees north, (no one to this day has penetrated two degrees more north,) having carefully mapped out, and named all they had seen in spite of all their sufferings; and having never once lost heart, or once violated discipline. But the bravest of them was not with them. The body of no nobler hero was ever committed to the cold waters of that sea where none but heroes sleep.

As this attempt to reach Cathay was to the N.E., I may here say that no ship sailing from Europe has ever got farther than the sea of Kara. The rest of the northern coast of Asia has been tracked by Russian exploring parties coming from inland or from Behring's Straits, but the northernmost point of Asia, the North East Cape, (Severai Vostochnoi) no boat or ship has ever doubled to this day. When Behring's straits were discovered A.D. 1740, the North East Passage was proved to exist, that is, it was proved that you could sail, if it were not for ice, starting north east, from England to India, by keeping to the coast of Asia.

In short if any one is puzzled by the terms N. E. and N. W. Passage, let him remember that a sailor starting from England and tracing the N. coast of Russia, till he could steer his ship south, would have discovered the N. E. passage to India; in the same way by tracing the N. coast of America till he could sail south he would have discovered the N. W. passage. We now know that there is only one passage (whether he should sail N. W. by America or N. E. by Russia), and that is through Behring's Straits. What we have to discover still is whether we can sail right across the Pole to Behring's Straits, instead of taking either of these circuitous routes. And I may as well describe to you here what this great region of the Pole is. You see that roughly speaking there is a great circle unexplored, of some 6000 miles in extent, with a surface one third larger than the continent of Europe. Now what does this circle contain? Some say an ice-bound sea, or ice-bound land. Others say that there is only a ring of ice round the continents of Europe and Asia, and that if you could cross this ring you would come to an open sea round the North Pole, and as its climate would be warmer you might find a new country with an unknown race of men dwelling on it. By and by I shall have to tell you of men trying to cross this ring to the North Pole. I have already described how this ring was traced to the North East. How it was traced to the North West many of you know. It was Sir John Franklin's party who traced it in the year 1848, almost a century after the N. E. passage had been ascertained. Sir John Franklin started in 1845, and, as he never returned from his expeditions it is only through records discovered in King William's Island that we have found out his success and his sorrowful fate. On the 22nd of May, 1850, Lieutenant De Haven set out from New York, being commissioned by the American Government to go in search of the missing ships. I had intended to tell the story of this expedition at length, but time presses and I can only say a few words about it. Here you see Davis Straits. North is Baffin's Bay. More north still is the north water. Anyone crossing from the Greenland to the American coast below 68 degrees of latitude takes what is called the South passage. Anyone coming between 68 and 70 degrees takes the middle passage. Anyone keeping close to the Greenland shore and crossing over above 74 degrees takes the north water passage. This north water is the freest from ice of the three, but before it can be reached, a mysterious region of terrors—an indentation of the Greenland coast—called Melville Bay, must be crossed.

This expedition had most glorious weather, as they tried in July to make the middle passage,—eternal sunshine, bright as in the Bay of Naples, and, owing to refraction, visions of fairy land. Just as when you look into clear water you see the clouds reflected and figures imaged again, only upside down, so that, as you stand at the edge, the soles of your feet seem to stand on the soles of the feet of your shadow, so they saw beautiful icebergs like cathedrals or grottoes or monuments, fired with every hue of unimagined splendour, and above them other cathedrals and monuments reversed. In the winter the whole bay is ice. The short arctic summer and the currents break up this winter pack. But in the middle the straggling fields of ice reunite into a sort of patchwork of ice—soft ice, hard ice, thick ice, thin ice, fragments of ice, and floes or fields of ice. Where two fields have been forced together the thinner ice is forced upwards and breaks into great piles called hummocks. This middle pack varies in its position, a N.W. wind drives it towards the Greenland coast, a N.E. wind to the American coast, but it nearly always chokes up most of Melville Bay. On the threshold of this bay they got stuck fast in the middle ice. There was nothing for it but to 'warp' and 'track.' A sailor gets out of the ship with a great hook or ice-anchor and plants it well a-head near a crack through which they hope to force the ship. I will give you a specimen of the sort of work this is. A man named Costa was sent to plant an anchor in a berg, but as he planted it the berg split with a noise like thunder, and a piece twice the size of the ship broke off, and Costa disappeared in the chasm.

Luckily as the berg came up it brought him with it and De Haven picked him off. When the anchor is planted, all hands heave at the hawser till the crack gives way and admits the ship, then another anchor is planted, and warping or the same process only easier, goes on. At last they get into a tolerable channel where however they cannot sail. A party of men get out and are harnessed to a line with which they go off by the edge of the ice, hauling the ship,—this is tracking. To show you what hopeful work this is, take this entry in Dr. Kane's diary: "July 14th and 15th, the American Expedition advanced half a ship's length," "July 22, advanced two yards." They managed at last to get across and cruised for a time with the English squadron off Griffith Island. Here they found some of the graves of Sir John Franklin's party. Dr. Kane, De Haven, and Captain Penny were talking over their plan of search one day when a seaman ran to him, calling "Graves! Captain Penny, graves! Franklin's winter quarters!" Imagine the thrill that ran through them. But soon afterwards De Haven was driven to sea by a storm and getting nipped by the ice, drifted slowly up Wellington Channel. From September 14th to June 8th of the following year they were perfectly helpless, drifting first to the N.E. up Wellington Channel and then back again into Baffin's Bay. It must have been weird work this slow mysterious drift, the cause of which was quite hidden from them.

But I shall only give you one or two incidents of the voyage. First imagine, if you can, the cold. The sun was soon gone. Some of us think ourselves very heroic if we get out of our warm beds at sunrise in October, and rushing down to the bathing place immerse ourselves for a short second under water just glazed over with ice about as thick as a piece of goldbeater-skin. These men had no sun; when they got a ducking in the water, as they did, some of them, in carrying the ice-anchors every day, the water froze on their clothes as they came out. In the sleeping room one night the thermometer was 16° above zero, and they had no fires when it had fallen to 11° below zero in the open air. Now the freezing point as you know is 32 above zero, so when the thermometer was 43 below freezing point they had no fires. Think of sitting in such cold weather to watch for a shot at a seal. And don't think this represents the lowest cold they went through. On February 6th the mercury in the thermometer froze, its parting record being 42° below zero, that is 74° below freezing point. In December the floes suddenly began to squeeze the ship and lift her bodily upwards till the stern mounted high in the air, and the bow pointed downwards, and for six months afterwards she remained in that position, so that to go from one end of the ship to the other was like walking up a hill. They of course thought she would heel over at once and the boatswain cried out to stand from under. At this moment one of the officers remembered that a fire had not been put out, and rushing on board to see to it found the officer who had been on watch duty when they left the ship, calmly eating his dinner, and the steward as calmly waiting on him. "You were a meal a-head of me," he said, "You didn't think I was going on the ice without my dinner!"

Before dismissing this expedition I may say that when after their long drift they at last got rid of the incubus of ice clinging to them, and reached Godhaven they only stayed there three days and once more turned their ships northwards to resume the search.

Let me here say a word about Arctic currents. I need not apologise for ignorance on this subject, it is an obscure subject to the most scientific men. But you are constantly hearing about the Gulf Stream, and it is a subject of speculation whether its course has not been altered lately so that it has come more directly towards our shores. Now what is this Gulf Stream? I give you one theory about it without pretending to say it is correct. According to this theory it rises in the Gulf of Mexico, flows north like a mighty river of warm water to the coast of Newfoundland, where it turns to the east and flows between Iceland and Ireland. Is is then supposed to go along the west coast of Nova Zembla, and to turn off again, perhaps at the N.E. Cape into the Arctic sea, and this it is supposed makes an open sea round the North Pole. There are counter currents also—one comes from north to south along the coast of Norway—another along the east coast of Greenland round Cape Farewell, and northwards again up to Melville Bay. But the great current down Baffin's Bay and Davis' Straits is from north to south and this current meets the Gulf Stream at Newfoundland. It is possible that the Gulf Stream, rising to the surface in the Polar Sea, causes the current down Kennedy Channel, Smith's Sound, and Davis' Straits. The water of the north Atlantic is thought to be less salt than that of the south, and it is this greater density which is supposed to be the cause of the Gulf Stream rushing up from the Gulf of Mexico.—And now I hope I have made the matter tolerably clear, and I can proceed to the most wonderful perhaps of all Arctic Expeditions, that of Dr. Kane in the year 1853.

The expedition commanded by Dr. Kane sailed on the 30th of May, 1853. There was only one ship, and that was our old friend the Advance, one of De Haven's ships in the years 1850 and 1851. The only rules for the ship's company were—1st, absolute obedience to the officers; 2nd, abstinence from all intoxicating liquors except when regularly dispensed; 3rd, habitual disuse of profane language. The simplicity of these regulations were characteristic of the commander. I shall not be able to say much of Dr. Kane personally, and indeed the best praise of such men is to record their deeds. Elaborate eulogies, except from the lips of genius, are almost always vulgar. I have seldom read anything in worse taste than his biography by Dr. Elder. If you wish to know him personally you had better read his narrative, which in my estimation ranks in interest as a boy's book side by side with Robinson Crusoe. He was a small man weighing less than 7 stone. He was one of those men whose bodily presence is weak and their speech contemptible, who at a right moment change the faith or fate of a world. No better description of him than can be given than in those hackneyed lines—

'A fiery soul which working out its way
Fretted the pigmy body to decay.'

He died when he was quite young. He was ill all his life. He never went out to sea without being horribly seasick all the time. Yet his voyages took up half his life. He travelled all over the world, crowding into his brief span of existence, adventures, escapes, and hard work, sufficient to fill the lives of a hundred other men. I think hero-worship a foolish creed, but of the half-dozen men of this century it would have been worth while to go many miles to see and hear, one of them certainly was Dr. Kane. He was accompanied on this cruise by two of De Haven's men, Brooks and Morton, two gallant men who stood staunchly by him through every danger. One of them, Morton, after the Expedition came back, attended him to England and was with him nursing him when he died.

The plan of the Expedition was to go to the north of Greenland and there make sledge expeditions in search of Sir J. Franklin east and west over the ice in co-operation with the Esquimaux. They sailed May 30th. When they got to Melville Bay, July 27th, they found it so clogged up with ice that Dr. Kane determined instead of keeping to the shore to double the bay. It was a bold move, but it was quite successful, and by boring through and skirting the middle pack, he safely reached the north water on August 3rd. Leaving Cape York and passing Conical Rock August 5th, Hakluyt Island August 6th, they were in sight of the two headlands of Smith's Sound—Capes Alexander and Isabella, and on August 7th built a cairn and left a boat and stores on Littleton Island. They proceeded northwards slowly, reaching Refuge Harbour on the 8th,—out of the harbour on the 10th. Mr. Sontag who planted the anchor was carried away on drifting ice, and lost for several hours. They were dreadfully embarassed by their fifty big Esquimaux dogs ravenous for food. One day they tried to eat a whole feather bed, another one of them gorged two big bird's nests, stones, feathers, filth, and moss, a peckful at least. When they came to a floe they would rush off in a pack to hunt, and could scarcely be got back to the brig. In this way they lost one. They were anchored to an islet (Godsend Ledge) when a hurricane came on, August 20th. They had three hawsers. First the six-inch hawser snapped. In half-a-minute, twang twang, went the whale-line. The great manilla 10-inch cable held them a while longer, its deep æolian chant swelling through all the rattle of the running gear and moaning of the shrouds. It was its death-song. The strands gave way with the noise of a gun, and in the smoke of the recoil they broke loose in the teeth of a furious gale and a driving torrent of ice. They dropped their heaviest anchor but it snapped off at once. On one side of them was ice thirty feet thick which scraped the ship's sides and sometimes rose over the gunwale and deposited half a ton of ice at a time on deck. On the other were great bergs bearing down on them so that they looked to be crushed between the two; but they fastened on to a berg which towed them like a noble horse, faster than the pale horse of Death following them through the passage when it was only forty feet wide. On the berg went, ploughing through the smaller ice, tossing the spray up scornfully, and hauling the boats from the davits they grazed through into open water. The little Advance had borne them through it all, as if she had a charmed life. They were now nearer the shore off C. Cornelius Grinnell but the storm still raged and being nipped by ice the ship actually was driven up the inclined face of a berg as if by the pressure of a steam engine amid the breathless silence of the crew. But for the groaning of the timbers and the moaning of the floe, you might have heard a pin drop. Then she quietly settled down into her old position as the floes relaxed. The whole crew though terribly harrassed behaved with the greatest bravery. Four times some of them were carried away by drifting ice. On the 22nd the storm lulled. They went tracking along the shore-ice four days more, and then the hearts of the crew sank, and with one exception, Mr. Brooks, they were for going south again to winter, as they could get no farther north that year. It was at this time Dr. Kane noted that grog was useless except as a stimulant for the moment. Hot coffee on the other hand gave them real and enduring strength and they always had recourse to it. Dr. Kane had no idea of giving in. He set out on a trip north, to examine the coast, starting in a boat which at high tide they hauled on to the ice-belt, and then pushed on in a sledge, the cliffs over-hanging them, the ice under their feet, and the sea roaring below. This ice-belt had ravines in it through which torrents poured down. In one of these ravines the tide came over at night and they had to hold their buffalo bed-clothes above their heads, and stand up in the water till it went down. In five days they made only forty miles, so leaving the sledge they walked on, and on the 5th September, came to Mary Minturn River, and were lulled by the rare music of running water. At last they came back, for Dr. Kane could find no better position for the brig than where she was already.—They warped in between the islands of the bay into Von Rensselaer Harbour, a snug resting place, and from that harbour the brave little *Advance* never stirred again.

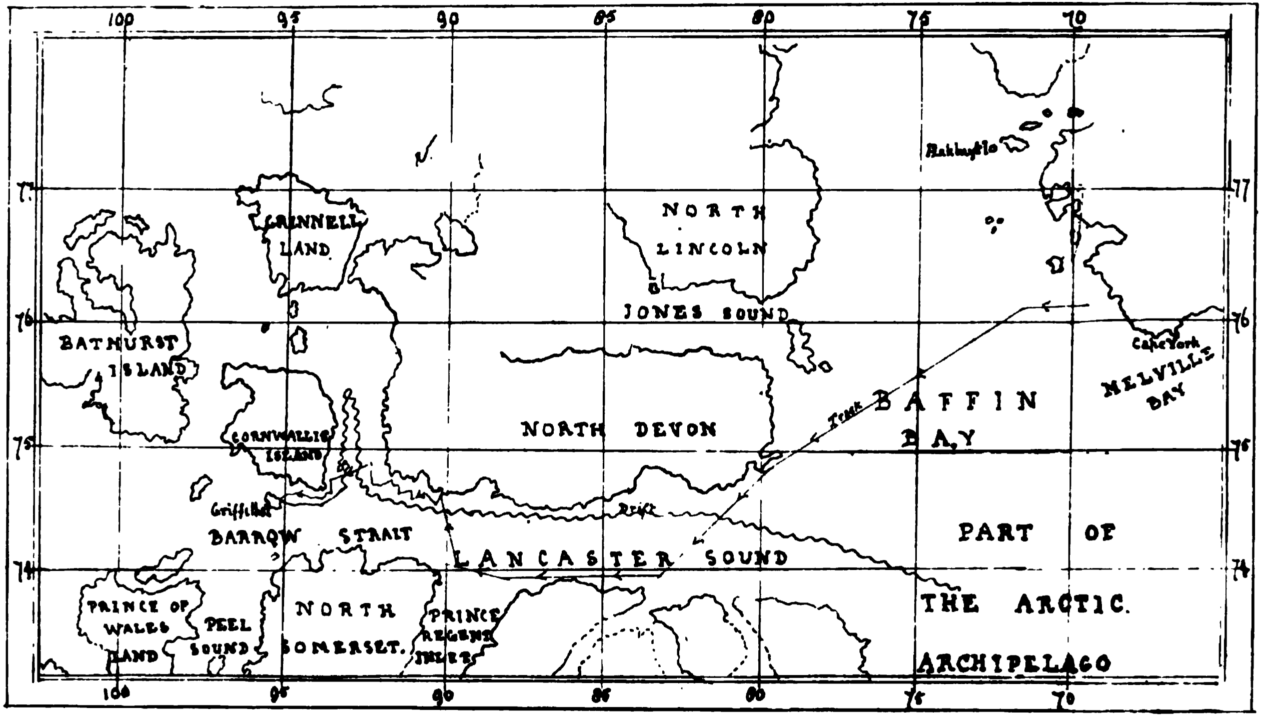
They were now in for a winter on the ice, and set about landing stores, building an Observatory, taming the dogs, and killing the rats aboard ship.

They nearly killed the cook Pierre Schubert in doing so. Dr. Hayes burnt a quantity of charcoal into which Pierre ventured in order to finish a soup. Morton fished him out half dead. The deck took fire during the operation. Dr. Kane discovered it and told Brooks, Ohlsen, and two others, and they put it out with difficulty. The result of all this smoking was the carnage of 28 rats. The dogs made short work of their carcases. These hungry animals now began to increase in numbers, but the mammas ate their puppies with relish and the others were made into mittens. The whips used to them is six yards long with an handle of only 10 inches, but a driver can flick any part of any dog in a team of a dozen. When Dr. Hayes was out, his driver pointed to an unruly leader and said, "You see dat dog, I take his ear off," and with a crack he whipped off the tip of one ear. You may imagine it is hard work to wield such a whip. Dr. Kane learnt, and when he came home from this voyage used to amuse himself with the two leaders of his old team he had brought home, Toodlamick and Whitey, before breakfast, he cracking the long thong and they in their fat and hairiness defying it but howling as if they felt it and always enjoying the game as much as he did.—When they took a tent ashore and slept in it the dogs slept with them, and the men were only too glad to lie among them for warmth. Dr. Kane sent out September 20th a party to make a depôt of provisions to the north with a view to future explorations. The party came back October 15th. They had had their adventures. McGary the joker of the ship, and one of the bravest of them had caught a fox. He couldn't skin it so tried to pluck it, and his fingers froze to the skin. They had built cabins and cachéd stores under them at Cape Russell, in Dallas Bay, and McGary Island.

The winter was now fairly upon them, a winter of 140 days without any sun, and everything portended a winter of more than usual severity. Poor Hans grew home-sick. He had left a sweetheart at Fiskernaes and packed up his bundle to go home. But Dr. Kane gave him first a dose of salts and then promotion and Hans recovered his peace of mind. Morton started on Friday 26th to pick up some articles previously left behind, (in cold so intense that whisky froze in a bottle which one of them had as a pillow) and came back on Sunday after marching sixty-two miles in darkness at noonday so deep that you could not see fifty paces ahead. Dr. Kane and Morton afterwards marched eighty-five miles in three consecutive marches. They amused themselves with the walruses and the dogs. Walruses in summer are to be found basking on rocks a hundred feet above the water. They climb up by the help of their long tusks. They also swallow stones, and sometimes the men found a peck or more of shingle which they had deposited on the ice. Their funniest dog was named Grim. He was a great hypocrite and timeserver and always managed to carry off the best morsels and shirk all work. As soon as the dogs were well, off he would go and hide till the sledge was away when he would emerge with many deprecating wags of the tail. At last Dr. Kane thought his health demanded exercise. So he had him caught and harnessed. The sledge went a mile, when Grim jerked his line, snapped it, and was never seen again.

Scurvy now came on the crew and, worse even than this, the dogs began to go mad and die off one after another. The darkness maddened them. They would eat ferociously and then run blindly about the deck snapping at everything till they dropped down or were shot. In vain Dr. Kane made soup of their own puppies for them and swaddled them in flannel. Of his fifty dogs he had only one left in March.

The cold was fearful—70° below freezing point. Only one barrel of potatoes was left. All their fresh meat was gone. Only Pierre and Morton were without scurvy. All were pale and haggard. Yet on the 20th of May Dr. Kane thinking ever of the search for Franklin sent out another depôt, giving them his last two bottles of port and a wedding cake of his brother's. They started in a sledge, made by Petersen too heavy for the work, so that they only got five miles the first day. Nothing would convince Petersen that it was the sledge that was in fault, so Dr. Kane prepared another sledge, waited till night, started for the camp of the sleeping party, unloaded their sledge and loaded the fresh one, then with the words, " Now boys when Mr. Brookes gives his third snore off with you" they ran away with the new sledge and its load some distance, waking the sleepers with three cheers to show the success of the experiment. On March 31st Dr. Kane wearing poor Flora the late leader of his team in the shape of a pair of socks, started off for a drive and was nearly killed. The dogs were required to leap a chasm to get up from the floe to the ice foot. They failed and went down sixteen feet into a roaring drift of broken ice. When Dr. Kane got down they nearly killed him with their caresses. And now comes an episode shewing what manner of man Dr. Kane was more than any panegyric could do. A wonderful, I may say an altogether unparalleled instance of a frail body forced by an unconquerable spirit into apparently impossible exertion. It was the same evening, March 31st. Dr. Kane though taking daily drives, was so scurvy stricken that he could not rise in the morning often without help. As the crew of the brig sat round their stove working, three of the depôt party, Ohlsen, Sontag, and Petersen staggered in. They were swollen, haggard, and almost unable to speak. They had a fearful story to tell. The rest they had left in the ice, risking their own lives to bring the news. Brooks, Baker, Wilson, and Pierre were all frozen and disabled. Where? They could not tell. Sontag and Petersen lost their faculties at once. Ohlsen with some little sense still remaining in him was fed, strapped in a fur bag on a sledge, and Dr. Kane and



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eight feeble men started off with only the clothes on their backs, when the thermometer was 78° below freezing point. It soon sank to 81° below, and worse than all a north wind set in. Ohlsen fell asleep and was half deranged when he woke. They could melt no water, and the snow when they put it to their mouths was like caustic and covered them with blood. There was nothing for it but to walk on and on and on. The strongest of the party, joking McGary, and Bonsall began to have trembling fits. They staggered on blindly not knowing where they went, having been eighteen hours without water or food. At last Hans saw a sledge-track. They followed it and came in sight of the American flag on a hummock, lower down a small masonic banner on a tent pole buried in a snow-drift. It was the camp. They had reached it after an unbroken march of 21 hours. Dr. Kane's companions drew aside delicately to let him go in first. As he crawled in the four poor fellows hailed him with joy. "They knew he would come, they had expected him," and he burst into tears.—Tired as they were, there was no time to lose. The sick were sewn up in bags, which took four hours, and they started back again, the thermometer being now 88° below freezing point.—In six hours they made six miles which Dr. Kane called "vigorous and cheering progress."—But when they had made nine miles their energies suddenly gave way. Bonsall and Morton came to beg to sleep a little. They were not cold they said, they only wanted to sleep. Presently Hans sank half stiff in a drift. Thomas Hickey followed him with eyes shut and tongue almost dumb. Then John Blake, one of the two bad fellows of the crew, threw himself down and refused to stir. Dr. Kane (think of it!) wrestled with them, boxed, ran, jeered at them. It was all useless. There were strong men there, and brave men, men like Morton, stalwart, faithful, and gallant sturdy as oak, true as steel. But there was only one hero, the frailest, feeblest, sickliest of them all. It was necessary to encamp. McGary was left with the tent into which the sick were put, and the others scrambled in and Dr. Kane set out to a half-way tent they had left when coming, with one man Godfrey, who was the other bad fellow of the crew but on this day atoned for many an after-fault. How they got there they did not know. It was nine miles. It probably took them four hours. They were in a stupor. They both remembered seeing a bear walking leisurely ahead of them and tearing up a wrapper McGary had left on the ice. When they reached the tent it was only just in time to save it from the same treatment. Without speaking they crawled into their reindeer bags and fell asleep for three hours.—When Dr. Kane awoke, his beard was a mass of ice frozen to the buffalo skins. Godfrey had to cut him out with his jack-knife. They melted water and had soup ready for the others when they came up. And then they all set out again for the brig.—It was a rough road over hummocks and drifted snow. They all became desperate.

They ate snow and, their mouths swelling, they became speechless. They fell down in the track and slept, and wonderful to say it did not kill them but strengthened them, and Dr. Kane allowed each to take occasional naps of three minutes. And so they reached the brig without a halt, they believed, at 1 P.M. They believed. For they were quite incoherent, when they came. Dr. Hayes met, as he says, a ghastly party. They gave him no recognition, but only a wild vacant stare. Their beards were ice. They were covered all over with frost. They looked like old men bent down in years. Dr. Kane alone seemed sensible, but when he had seen the sick cared for and lain down in his cot he called the doctor and ordered him to call "all hands to lay aft and take two reefs in the stove pipe," so that Dr. Hayes submitted respectfully that he too must have been wandering. It was a long time before they got over the expedition. One of them, Baker, soon died. He was quite young, nineteen or twenty and a devoted admirer of Dr. Kane, who was deeply affected by his death. He says "I never gave him a hard word or a harsh thought." Prostrated by illness and grief for Baker, and lying exhausted in his bunk he heard one day, a week later, a shout from McGary "Esquimaux alongside. Quick as a flash he was on his legs and dressed, and the only words he said were "I'll make my journey now." Think of that! He was even then dreaming of Franklin. In a few seconds he was on deck, a sick man no more, and in half-an-hour had purchased a team of dogs for a few needles.

The chief of these Esquimaux was called Metek, big, strong, and full of fleas. He and his friends came on board quite fearlessly, and sat down comfortably to a little meal of some 5 lbs. per head of raw walrus meat, their manner of eating being to put a big slice into their mouths, and cut it off level with the lips and then gorge it, then sleep a few winks, and repeat the process. On a subsequent occasion Hans told Dr. Kane what he had seen a baby eat, "Cappen Ken even the children ate all night! You know the little two year old Awiu carried, the one that bit you when you tickled it, well that baby cut for herself with a knife made out of an iron hoop, and so heavy that it could scarcely lift it, and cut and ate, and cut and ate as long as I looked at it." "Well Hans" said Dr. Kane, "you are a truthful man, how much do you think it ate? Hans pondered and said he couldn't tell, but "I know this, it ate a 'sipak' as big as its own head, and three hours after when I went to bed it was cutting off another lump and eating still."

With the new dogs Dr. Kane organised a new expedition, though, as he says, though they were eighteen souls, they were certainly not eighteen bodies now on the brig. McGary was sent a-head. Dr. Kane and Godfrey followed after. It was to be the crowning expedition of the campaign to penetrate to the north. They set out April 26th. On the 28th they caught up Mc. Gary. They found that the bears had robbed the cachés, twisting up the iron in play into balls and sliding down on the rocks on their haunches as was to be seen by the hair they had left in the process. It was probably this dreadful blow as much even as his weakness which upset Dr. Kane. Off Cape James Kent he suddenly fainted. On the 5th he became delirious, and they bore him back to the brig apparently dying. Dr. Hayes thought he could not possibly be re-called to life.—On the 20th however he was able to resume his journal, and to note that the brave and merry cook Pierre Schubert was dead, the second victim of that awful rescue journey. He trolled gay songs from Beranger to the last. On that day Dr. Kane sent out Hayes and Godfrey to try their luck in a new direction. Hayes was the only educated officer left well. The rest were on their backs though some of the men were still strong and able to sleep in their walking suits at 62° below freezing point. On May 30th Dr. Kane reflects in his journal as follows.—"There must be many such men among Franklin's crew. I picture them parted into little broken-up detachments living by spearing the bear, trapping the fox, and killing seals and walrus and whale. I think of them even with hope. I sicken not to be able to reach them."

This is one of the most pathetic records I ever read. "He sickened not to be able to reach them." It was just sixteen days since he lay as they thought dying in his bunk from which he could not yet crawl. It seems to illustrate well a common observation, for if the words were almost ridiculous the spirit was altogether sublime.

Dr. Hayes came back June 1st, after a toilsome march, which I will not describe. Godfrey soon after starting had a shot at him not wishing to face such a march. Hayes took no notice of it then or in his report of their travel to Dr. Kane. The result was that no exit from the bay to the north had been found though the west coast had been traced some way.

So Dr. Kane organised another expedition. These were his materials :—

Brooks	Unhealed Stump
Wilson	Ditto
Sontag	Down with Scurvy
Bonsell	Scurvy knee
Petersen	Scurvy
Goodfellow	Scurvy
Ohlsen	Well
McGary	Well
Morton	Nearly well
Hickey	Well
Whipple	Scurvy
Blake	Scurvy
Hans	Well
Riley	Sound

Stephenson ....Scurvy
Godfrey...........................Snow Blind

Morton, McGary, Bonsall, Hickey and Riley were sent off, Hans to follow. When Hans came up he and Morton were to go across the bay and push north. The rest were to scale the great glacier. They started June 4th. Dr. Kane went out seal hunting meanwhile. He sat watching a seal one side of a hole, and a bear the other. He fired, but the cap only exploded. Plunge went the seal and Dr. Kane took to his heels. On looking round he saw the bear equally frightened scuttling away in the opposite direction. On the 27th McGary came back quite blind. They had reached the great glacier and failed to scale it. While asleep in their tent a bear had come to the door, and walking up they saw him walking in, and he began to eat a seal they had on the floor. Tom Hickey, the Paddy of the crew, cut a way with his knife through the tent and running round got a gun and shot him. This glacier was sixty miles wide, so rugged and precipitous as to be quite impassable. Just as our hills throw off rivers, so Greenland hills throw off frozen rivers, and these frozen rivers are the glaciers which though their motion is imperceptible glide onwards into the sea, plough under it sometimes a quarter or half a mile, till the buoyancy of the water drifts them away. That is the way icebergs are formed not as you might think by dropping off cliffs into the sea, but rising up out of the sea.

On the 10th Morton and Hans came back.—They had had a wonderful trip and made a startling discovery. Leaving McGary Island June 18th, at 4.20, they were in the middle of Peabody Bay. They found themselves in the middle of bergs and hummocks unable to see their way ahead, but by dint of toiling on stubbornly they got abreast of the end of the Great Glacier at 7.20 next morning. On June 21st they stood to the north, but the ice became weak and rotten, and the dogs trembled and refused to advance. Hans had to go ahead and coax them on, when they would crawl on their bellies to him one by one. They reached the ice-foot, and pulling the sledge on end climbed up and hauled the dogs after them. After doubling Cape Andrew Jackson the ice-foot was good and they went six miles an hour. On the 24th they reached Cape Constitution. In vain they tried to double it. The ice-foot ceased. They could not scale it and climbing 500 feet up the rocks 2000 feet high, Morton to his extreme wonder saw in front of him to the north stretching far away to a dim iceless horizon, an open sea.—He stood on the most northern point of the then known globe. He unfurled a flag which I may call the most glorious flag in the whole world. It had been saved from the wreck of a United States sloop of war. It had sailed with Commodore Wilkes to the Antarctic Seas when he discovered a new continent. It now floated on Cape Constitution. It was subsequently unfurled over the grave in which Dr. Kane's body was placed. And lastly Dr. Hayes unfurled it on a still higher point north, beyond which no living man has yet advanced. The birds in great flocks were flying northwards. A current set northwards. Vegetation was much more advanced than to the south. There was the moan of dashing waves. Dr. Hayes two years afterwards went some 100 miles higher, and the same sight was to be seen. He and Dr. Kane both were of opinion that they stood on the shores of an unknown sea, a sea round the Pole, which may contain another world, and a strange race of men.

By this time Dr. Kanes party had become fearfully desponding. The ice was quite fast round the Advance, and he dreaded the prospect of another winter. He thought he would try and reach Beechy Island, where he hoped some English ships were. I must omit his journey. It failed. I will show you the track of it on the map. Mc. Gary on this occasion stood steering the boat with an oar, in a storm, for 22 hours without aid.

They came back August 7th. On August 24th a council was called, and Dr. Kane said anyone might start for the south who liked, he should stick to the brig for he did'nt believe they could reach the south. Brooks, Morton, Mc. Gary, Ohlsen, Wilson, Goodfellow, Hickey, and Hans stayed with him. The rest under Dr. Hayes left the brig. Sadly Dr. Kane saw them slowly dropping out of sight. He then set vigorously to work with preparations for the winter, roofing in the brig with moss, collecting firewood and scurvy grass and hunting seals. Going out with Hans for seal, he and the sledge and dogs went through into the water. Toodlamick the leader, nearly drowned him by his piteous caresses, and when he had cut the traces and released the dogs he could not get out himself. He swam round and round the hole, but the ice gave way as fast as he tried to land. Hans stood on firm ice uttering a pious ejaculation every time he failed to effect a lodgement. When just sinking he managed to get safe by means of the sledge, and Hans, overjoyed, frictioned him with frightful zeal. Near the end of August another party of Esquimaux came. Dr. Kane gave them a good feast, and they repaid him by walking off with his lamp and Nannook, his best dog, and cutting his India Rubber Boat to pieces. Dr. Kane instantly sent off Morton and Riley, who marched to the nearest settlement, Anoatok, and brought back the wife of Metek and another woman as hostages, making them walk the whole thirty miles. This prompt justice overawed the Esquimaux and they made a treaty with Dr. Kane and promised to give him help in all his plans, a promise they fully redeemed and never stole anything again. Morton and Mc. Gary went to visit them and they gave them a hearty welcome, and, as at this time a tramp of 160 miles was thought nothing of, Dr. Kane set off walrus hunting in their company. He walked in a fearful storm 49 miles in 20 haltless hours and slept with them in their hut, they lulling him to sleep with a song of Nalegak Soak Soak, which in his dreams blended with school memories of the "Frogs." These Esquimaux as a rule strip themselves naked in the coldest air, and hang up their clothes to dry, then creep in and sleep in a mass in their hut. Before entering it they will stand scratching themselves in the open air when the cold is 70° below freezing point. On another occasion Dr. Kane followed their example, for coming out of the cold some 60 below freezing point into an atmosphere 120 above freezing-point, into a hut measuring fifteen feet long by six wide, with fourteen fat Esquimaux round a number of lamps, he could not keep his clothes on. So he stuck the baby under his arm for a cushion, and to use his own words, "pillowed his head on Myouk's somewhat warm stomach," and so slept out the night. These Esquimaux have a custom of crying every now and then without apparent reason. On this occasion the chief matron Mrs. Eiderduck suddenly began to weep. It is etiquette always to join them. So Dr. Kane instantly took out his pocket handkerchief, and first shedding a decent tear himself, politely wiped her eyes. She rewarded his presence of mind by a great compliment: she took a morsel she was masticating and presented it to him, and he composedly finished its deglutition. Surely this may be considered the crowning act of heroism in the whole expedition.

They hunt walrus in this fashion. A walrus appears at a hole in the ice. They get cautiously near and harpoon him, running away with the line and planting it by means of a spike in the ice. The walrus furiously plunges about the hole for a time and then dives. Immediately the hunter runs away with the line and plants it elsewhere, and scarcely has he done so when up comes the walrus through the ice just where the first plant was made. And so the game goes on till exhaustion puts an end to it.

They were now troubled by bears and rats. One bear came right up to the brig and walked off with a barrel of herrings. She and her cub were shot and eaten. Esquimaux dogs are trained to hunt bears in this way. One dog nips him behind and as she turns and pursues, another gives a nip the other side. If he catches one he grips it with his teeth, and hurls it to a distance and the dog falls quite limp and unresisting, so that he is not hurt and ready to take his place again in the fight. The bear when her cub is wounded will put it between her fore legs and almost talk to it, to urge it to run faster. When the old one is killed the little ones mount her body, and, standing on their hind legs, do battle for the mother's corpse.

As for the rats, Dr. Kane could not put a hand into his mitten without finding a nest and being bitten to the bone, and as he snatched away his hand the combined family would run off with the glove. He sent down one of the sluts, Rhina, into the hold. But instead of her killing the rats, they immediately began very coolly to gnaw off her nails and the horny skin of her paws, so that she was drawn up howling and beaten. Dr. Kane caught a fox and trained it to rat-catching, and he himself took to eating the rats. His companions were more squeamish in taste, so he had all the more fresh meat. Perhaps it was this support which helped him in a trip with the Esquimaux to support Myouk after they had walked for thirty miles at a stretch. Dr. Kane made it a point never to shew fatigue to the Esquimaux, so he cheerfully lugged on the big fellow who could have carried four of his size.

As the winter darkness set in and their fuel grew less, the poor forlorn little crew grew homesick and dismal. Mc. Gary paced the deck all Sunday, November 12th, without eating a meal. The only three not ill were Riley, Morton, Ohlsen. On December 2nd Mc. Gary was down and expected to die. Brooks was dangerously ill. Dr. Kane meted out to them 2 of 12 remaining potatoes raw, more precious to them at that time than two diamonds of equal size. This awful disease, scurvy (which softens all the limbs, contracts the muscles till they decay away, covers the body with running sores, eats away the gums, and fills the sufferer with the most frightful feeling of despair) is caused by want of fresh meat and vegetables. Dr. Kane was sorely stricken with it, but his stiff limbs relaxed fast enough one day when going bear-hunting, he was suddenly charged by what he thought was a lump of ice, and he only saved himself by throwing away first one mitten then another to the pursuing bear. Soon after this adventure the moss of the brig took fire. Dr. Kane fell down the hatchway in putting it out, and had his beard, eyebrows, and fore-lock burnt off.

On the 7th of December, he was awoke by the cry of "Esquimaux alongside." They were bringing Bonsall and Peterson with news that the others of the seceding party had broken down 200 miles off and were starving. On the 12th the rest were brought in, the thermometer being at 82° below freezing point, and Dr. Kane, though he could ill afford such an addition of sick men to eat up his small stores, welcomed them like brothers. It was a proud moment for him. They had despised his advice and deserted the ship, and now they were dependent on his bounty again. Not that he had any other feeling than of sad pity for their sufferings. Dr. Hayes lost the toes of one foot and all of the party were more or less injured.

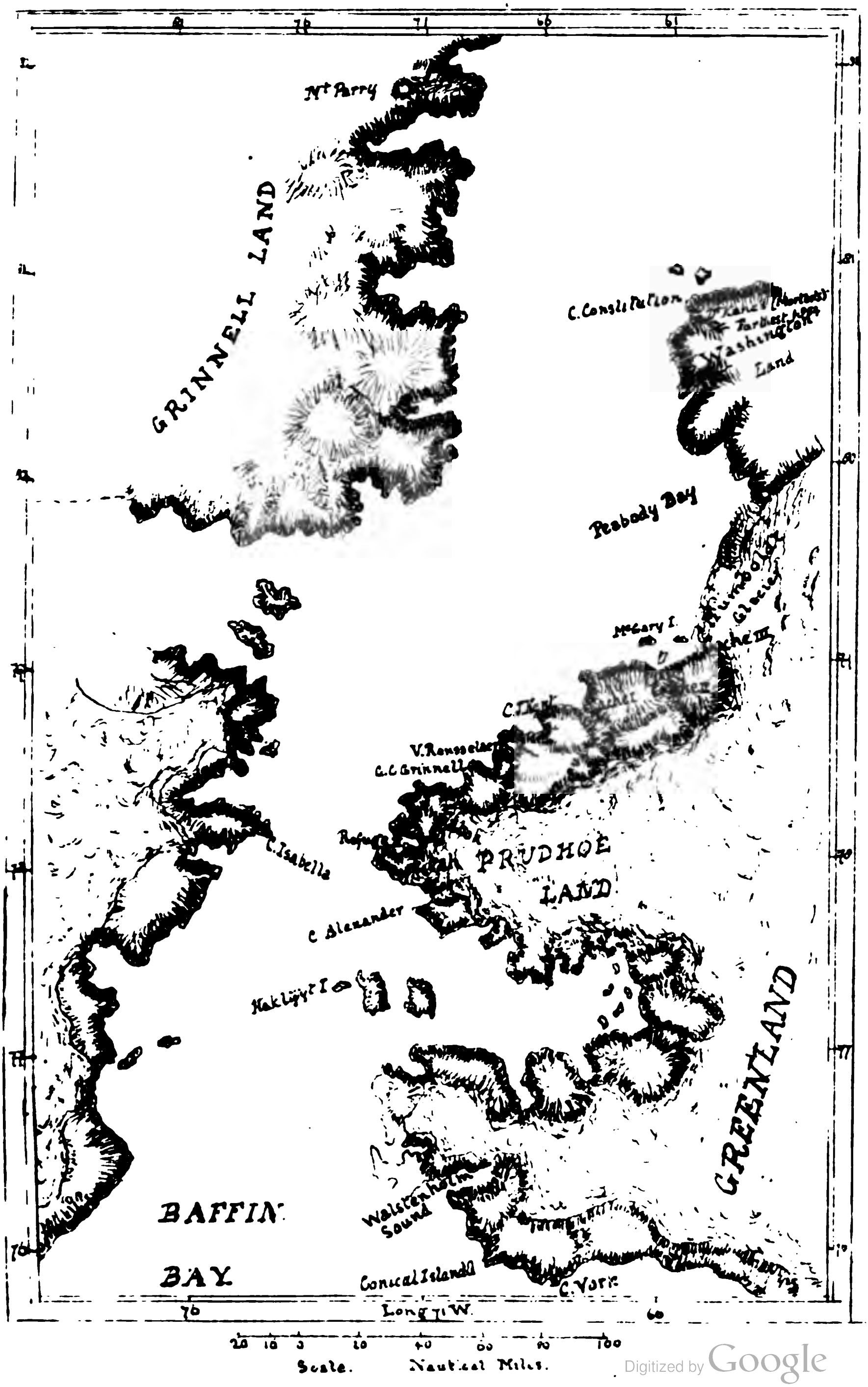
On December 25th, they drank the health of friends at home with ferocious zest over one-eighteenth part of a bottle of champagne—the last of their hamper, and amused themselves by passing round in imagination, turkey, roast beef, and above all in their scurvy-sickened longings, potatoes, melons, and cucumbers. Mc. Gary kept them laughing by his stories.

On December 28th, Dr. Kane set out to go out to the Esquimaux for fresh meat. He and Petersen were caught in a furious gale and had to encamp.

Petersen woke him with the horrible words "Captain Kane the light's out." To their great joy they struck a light, but they were obliged to go back unsuccessful to the brig. The dogs were now quite subdued, one of them licked Dr. Kane's hand—a thing an Esquimaux dog never does. He was at his wits' end how to feed them, till one morning Old Yellow, as Dr. Kane was feeding Jenny and her puppies, suddenly snapped up one of them and gobbled it down before the Doctor could turn round. He took the hint and refreshed old Yellow with a puppy for his breakfast till they were gone.

Dr. Kane made a second attempt to reach the Esquimaux and failed, and sent off Peterson and Hans who also failed. They were now in a fearful condition. Their meat was gone; they had only five well men on the ship, the rest were disabled. Dr. Kane was the working man of the crew. At last only he and Bonsall were left. He brewed strange drinks for them; he tried to make the sick eat strange food. These were his day's duties—to chop 1½ sacks of ice for water, to cut three fathoms of frozen rope for fire, to hack some molasses, to hew out pork and dried apples with crowbar and pickaxe, to perform all the nauseous duties of nurse to the sick, cook, keep watch, and note the the thermometer. The old scurvy-wounds opened afresh, and Mc. Gary, Brooks, and Wilson were in a bad way. Brooks catching sight of himself in a looking glass burst into tears. This was the sort of talk Dr. Kane listened to from the banks.

Brooks says "Well Mr. Ohlsen, I thought we never should have got through them hummocks. I fell down and don't remember no more till Petersen crawled into the tent. I think I must have strained something and gone off like into a kind of fit." (He was talking of that famous rescue expedition.) Ohlsen answers, "Yes! my boots pinched me then," and Brooks says "Yes, and Baker's boot pinched him too, but it wasn't the boots but the killing cold outside the boots. There was Pierre, his boots were moccassins with deer skin foot rags, but he died for all that, and there's Mr. Wilson and me now laying on neither one way nor tother, its a question which of us lasts longest." Then McGary gets up and checks Brooks for being so downhearted. Brooks growls at him and goes on. "Captain Kane five nights to come one year you came on four of us flat as a flounder. I didn't look at your boots, but I know you wore Esquimaux ones. It was a hard walk for you, the greatest thing ever I heard tell of, but"—here he began to soliloquise—"Baker's dead, and Pierre's dead, and Wilson and I"—Then Dr. Kane broke in "Shut up Brooks, you'll hurt the others;" but no! the old times were strong on him, and catching hold of Dr. Kane's arm he said in low, bass, quiet tones, "Doctor you cried when you saw us, and didn't pull up till we jabbed the stopper down the whiske" tin and gave you a tot of it.


81
76
71
66
61
Mt Parry
GRINNELL LAND
C. Constitution
Kane's (Morton's) Farthest 1854
Washington Land
Peabody Bay
Humboldt Glacier
McGary I.
C. Jackson
V. Rensselaer
C. C. Grinnell
Refuge
C. Isabella
PRUDHOE LAND
C. Alexander
Hakluyt I
GREENLAND
BAFFIN BAY
Walstenholm Sound
Conical Island
C. York
70
Long. W.
60
20 10 0 20 40 60 80 100
Scale. Nautical Miles.

On February 23rd, Hans shot a deer. All who could stand went to pull it in, but were so weak that it took them a very long time. But it saved the lives of some of them.

On March 9th, Hans again brought them some walrus. Dr. Kane had sent him to the Esquimaux and he found them also starving. They had eaten all but four dogs. But he went out with them and killed a walrus and brought part home.

One of them was called Awahtok, 22 years old, his wife 18, both pleasant and good natured looking, with a fine little girl. Hans casually told Dr. Kane that Awahtok had just buried this child alive under a heap of stones,—Dr. Kane sent off Hans a second time to hunt with the Esquimaux, for either he must get food or his men must die.

Two of them, Godfrey and Blake, were strong and well, and these two were as I have said, the bad ones of the party. They tried to desert but Dr. Kane hid himself and pounced out on the big Godfrey as he was slipping off, and taking him below flogged him, after reading out a long list of his offences.—Godfrey vowed reformation and was set free, but in half an hour after deserted.

Dr. Kane was terribly alarmed for Hans, for he felt sure Godfrey would rob and perhaps murder him, and as Hans did not return grew more alarmed. Amid all this misery and drudgery on March 25th he records that his brains got working on Bunyan's Delectable Mountains, which his fancy identified with the mountains to the north. "Once on your coasts O inaccessible mountains I would reach the Northern Ocean and gather together the remnants of poor Franklin's company. These would be to me like orchards, and vineyards, and running fountains, and we would look down on a Polar Sea refulgent with sunshine." Still, you see, he was thinking of Franklin, of Franklin always, through all his sorrows. Then as his spirits sank again he bethought himself how that at the foot of the Delectable Mountains lay dashed to pieces many whose bones lie unburied to this day.

On April Hans was reported coming back.

It turned out to be not Hans but Godfrey with a sledge of walrus meat. Dr. Kane went with a pistol and summoned him to surrender. He would only come to the gangway and while Dr. Kane went for irons was left under Mr. Bonsall's charge. He turned to run just as the Doctor came on deck. Mr. Bonsall's pistol missed fire. Dr. Kane snatched up a rifle but it missed fire. A third piece went off but it was a long shot and the man escaped. They found afterwards Godfrey had brought the meat hoping to make a bargain with Dr. Kane for his liberty with it. On April 10th Dr. Kane went on a sledge and to his great joy found Hans coming back.

Hans had been ill at Etah, and the Esquimaux had nursed him kindly. Godfrey was there playing the great man. So on the 18th Dr. Kane set out disguised as an Esquimaux for that place, met Godfrey as he drove in, clapped a pistol to his head, handcuffed him and brought him back in triumph to the brig.

I must hasten on now to the end. Two more attempts Dr. Kane made to explore the North coast, but both failed. It became plain too that the ice would not relax its grip of the Advance that summer, so that they must either winter again or escape over the ice. To winter again simply meant to die.—So they prepared for the other alternative. 1300 miles lay between them and their destination. The four sick and helpless men—luckless members of Dr. Hayes' seceding party were removed to Anoatok. These last were mounted on sledges. The man were all equipped with ruc-raddies or harness belts. On the last Sunday Dr. Kane read prayers, and then all standing silently round, took down Sir John Franklin's picture and wrapped it in India Rubber. He then explained the necessity of the step he was taking, and everyone signed an address thanking him and approving of what he did. There was no mockery of cheers. They set out firmly but sadly with their two boats of well-omened names, The Faith and The Hope. They hauled all day and returned and slept in the brig at night till they had got so far that the walk home became too much Dr. Kane on a sledge went again and again to it to bake bread for the others till they had got 60 or 70 miles away.

His last visit was with Metek. He and all the Esquimaux were gorging now on myriads of birds which they eat raw, and bear's meat. They often have narrow escapes from bears, running for their lives and getting nipped in the calves of the leg by them. Metek was suffering from a bite somewhat higher up. Awahtok and Myouk had had during the winter a fearful adventure. They had killed a walrus and with the carcase drifted away on the ice. There without any shelter, they remained with the cold 70° below freezing point a whole month, in the dark, the sea washing over them sometimes. But they drifted to the coast at last and were received by their friends as if they had come from the tomb.

These Esquimaux gave Dr. Kane most generous help. He did not tell them he was going away for good but only on a hunting party, for he had never felt quite sure how far their friendship was owing to fear. But now they proved themselves disinterestedly friendly and when he finally parted from them at Littleton Island, Dr. Kane felt real pity and regret. Presents were given them all round, Metek getting the big surgical knife, Mrs. Eiderduck plenty of needles, and Dr. Kane pow-wowing the little pot bellied child of Metek. They had hard work to reach the sea and but for the Esquimaux could never have succeeded. One of the sledges with all the documents went through the ice to the bitter grief of all, but to their great joy it was fished up again. A second time a sledge was saved by Ohlsen who by a great exertion of strength held it up as it fell through. But it cost him his life. Dr. Kane concealed his death from the Esquimaux and sending them off to hunt birds buried him under a cape which bears his name, laying on his manly breast a tablet of lead with his name and age on it. Then he says he thought sorrowfully how like his own story was to that of Barendz two hundred and fifty seven years before. Crews of the same number. Deaths of the same number. And then the thought how last of all Barendz perished himself, and his spirit seems to have sunk for the first time. The story of their wonderful home journey is full of excitement but I must omit it. Sometimes they hoisted sails on the sledges and sailed on the ice with a fair wind. Sometimes they hauled all day through hummocks with a mile or two's progress. They launched on the water once more at Cape Alexander. One of their party had deserted than. It was Hans. When ill at Etah he had been tenderly nursed by a young Esquimaux lady and he and she had been seen lately driving south together in a sledge. "Good luck go with him" says Dr. Kane "for he was a right good fellow." Hans' old Fiskernaes sweetheart probably would not have endorsed that verdict. To their great horror the helmsman once missed his way and they went miles out of their course into a cul de sac of icebergs, and had wearily to go back the whole journey again. Their strength gave way. The found they could not stir their boats one day and thought the ice must be holding them, not knowing it was their own strength gone. Before they got to Cape Shackleton their food failed them. They were actually starving when they saw a seal floating on a small patch of ice. They muffled the oars in stockings and breathlessly drew near. Petersen was ordered to fire but trembled so that he could scarcely do it. Just as the seal raised his head preparing to plunge Dr. Kane nervously gave the signal. Crash went the rifle and with a wolfish howl the whole crew rushed to the spot and found the seal dead. They all sat down and began at once on the raw blubber sucking their bloody fingers with ecstasy. Dr. Kane says he had then hardly realised what a dreadful condition they had been in. At the beginning of August they were off the Devil's Thumb. Petersen woke up Dr. Kane to tell him a story. He had seen a native in a kayack and recognized him, "Paul Zacharias don't you know me, I'm Karl Petersen." "No" the other answered," his wife says he is dead," and paddled away in a fright. Two days after they heard through a fog the sound of oars. "Listen, Petersen, what is it," Dr. Kane said in a whisper. How the men bent to their oars! Soon a vessel was in sight. And Petersen burst into a fit of hysterical crying. "'Tis the Upernavik oil boat. Tis Fraulein Flaischer and Carlie Mossyn on his voyage for blubber." Sure enough it was Carlie Mossyn. They asked what was the news. "Sebastopol not taken." Sebastopol? What was Sebastopol? Where was Sebastopol? But what of Sir John Franklin? And they told them his relics had been found 1000 miles to the south of where they had searched. And so they cut oars and rowed again into the fog. Very soon Saunderson's Hope was in sight. They heard the bay of dogs. They heard a bell which Petersen knew the sound of. Could it be a dream! They hugged the land round the cape. They were on the shore. The music of a hymn of welcome was sounding in their ears. For the last time they hauled their boats upon the rocks. For eighty-four days they had lived in the open air. Their habits were hard, and weather-worn. They could not stay in a house without feeling suffocated. But that night they drank coffee before many a hospitable hearth. They left Upernavick on the 6th, and on the 11th reached Godhaven. An American vessel stood in. Dr. Kane rowed out to meet it. The officer, Captain Heartstene, who had been sent to search for him was on deck, and hailed the little man in a ragged flannel shirt. Are you Dr. Kane? Yes.

There were 69 persons present: 3 Hon members, 16 members and 50 visitors.

APRIL 9TH, 1869.

A Conversazione was held in the Adderley Library to commemorate the 5th anniversary of the Foundation of the Society.

Selections from the different collections in the Society's Museum, as well as specimens of all the Plants in flower in the neighbourhood were arranged round the sides of the Library. C. M. Bull, Esq., lent a valuable collection of Coins, and R. W. Taylor, Esq., a large collection of Photographs.

J. Walker, Esq., M.D., sent down 4 fine Binoculars from Ross, with every requisite for showing them.

About 40 visitors from Marlborough were present, and 100 members of the School, together with the majority of the Masters.

Before entering the Library a Lecture on Carbon, illustrated by experiments, was given by Dr. Fergus in the Museum, followed by some electrical experiments by F. Giles.

Refreshments were provided by the College, and after the departure of the company the members and their visitors sat down to a substantial supper in Hall, also provided by the College.

MEETING HELD APRIL 16TH, 1869.

Geology—F. Giles exhibited a fossil bone from Battle, presented by F. H. Bowles; also specimens of Landscape marble from Clifton, Septaria from the Oxford Clay, an Echinus covered with Serpulæ from the chalk, &c.

Ornithology—J. B. Fuller passed round a list of notices, and exhibited a small box of Australian beetles.

Zoology—The President exhibited specimens of Spider Monkey, Vampire bat, and two fish, the White Bream and Tetrodon.

H. M. Hilton then read the following paper on

"COLLECTING INSECTS."

I will apply myself this evening to telling you what little I can on the subject of capturing and preserving Lepidoptera, and the rearing of their larvæ.

A beginner in this noble pursuit is generally so full of eagerness to catch everything and go everywhere that he defeats his own purpose; this being the case, let us briefly go through the preparations for the most delightful of all things, a day's butterflying excursion in June or the beginning of July.

Now first and foremost, what instruments shall we require? of course, we must have a net to catch, and a box wherein to pin our captives. But of nets 'there are many kinds,' the one most commonly used however is the *ring* net; this important instrument I would recommend all to make for themselves, for it is essentially necessary that the Entomologist should have a net particularly after his own liking, the weight of it being a great point of consideration. The size I should recommend for the bag, as being best adapted for common purposes, would be about two feet and a quarter long, and *not terminating in a point.*

Though the *ring* net is in general use, another kind of net is sometimes made use of by Entomologists viz: the *clap* net. Of this one reads more than one sees.

A *small ring* net always ought to be carried with us in case the day, contrary to our expectations, should turn out dull, for then it will be found of great service in easily capturing insects reposing on the bark of trees, palings, &c. This can be easily made of a piece of strong wire twisted and covered with green gauze after the manner of a common ring net. It should not be more than a quarter of a foot long from the top of the net to the end of the (wire) handle so that it can easily go into the pocket.

I have found the long net which is used for Purple Emperors useful in catching specimens of *G. Rubricollis* off the low oaks, and sometimes Hair-streaks, but it is a very unwieldy instrument. Except off the low oaks they could be easily reached with a simple net. I have found it the best plan for Hair-streaks, and *Rubricollis*, especially "Hair-streaks," to climb into a small oak tree that they are seen to frequent. Try to find five or six small oaks in a line, on the outskirts of a wood if possible, then mount one about the middle and get along the outside branches as far as they will bear you: in this way you will be able to reach the outside foliage of the tree which the Hair-streaks frequent.

The *best* time to catch them is about five o'clock in the evening. At this time they seem unusually lively and come out in great quantities. All insect life seems to get lively about that time. The catching of the Black Hair-streak (*T. Pruni)* is a far more serious matter, even if one by very good luck happens to live in a locality for them. They frequent the tops of blackthorn bushes from which they have to be beaten.

One other net there is which goes by the name of an *umbrella* net, as it shuts up and unfolds with the same celerity as an umbrella would. Mr. Coleman suggests that this was intended for the more timid part of the brotherhood who were afraid of the remarks of a *populace* on the carrying such an article as a butterfly net. But here was the difficulty; if it was a sunny day it was an absurdity to carry an (apparent) umbrella, if a wet day what an absurdity to keep a huge umbrella under one's arm for fear of its getting wet.

Equipped with a net, the article that next claims our attention is exceedingly simple, and does not entail the slightest expense. It is a *beating stick.* It is of course particularly needed on a dull day, for then insects, otherwise attracted out by the sun, are underneath the leaves of the trees from which it needs more than one smite, sometimes three or four, to dislodge them or send them flying out. Some fine specimens of rare insects are often to be obtained in this way. The collector, however, must in this pursuit have very sharp eyes, for the insects often fall straight from the boughs on which they were lodged and bury themselves in the long grass.

The next thing needed, having obtained the instruments "to catch the hare" is to obtain those we need "to cook it."

For this purpose a small collecting box is necessary such as we all know; besides this, should be carried by every collector, pill boxes innumerable. In these pill boxes are imprisoned those small *Geometræ* or other smaller insects that would become stiff were we to leave them till our arrival home. Instead of a common collecting box, a very nice one can be made by obtaining a large tin box, covering the bottom with cork, and leaving a space between some green gauze and the top in which to place bruised laurel leaves, so that we can keep our newly procured specimens from stiffening till our return home. This can be conveniently strapped over the back.

Besides the above, especially in spring, we should take (i) a larva tin or box; the former of which is preferable as it is cooler. In this should be placed some of the leaves on which the caterpillar is feeding. If possible two tins might be carried, as caterpillars of different genera have habits of preying on each other. (ii) Some pins—(iii) A note book for the double purpose of natural history notes and preserving small plants. (iv) A packet of provisions.

It is no good going out when a cold north wind is blowing; on such days we should hardly get many insects even by beating. If there is one thing an insect has an objection to more than another it is a north or north-east wind.

Coleman remarks that insects do not seem to be at all influenced by the picturesque or romantic in choosing their favourite haunts, and quotes the instances of the "large Copper" (*C. Dispar*) and the "Swallow-tail" (*P. Machaon*) as instances, both being found in the fens of Cambridgeshire and Huntingdonshire. I daresay this has been already observed by the least observant among us. How our gardens, the very places where we should expect butterflies to swarm, are only frequented here and there by a casual "white" or "brimstone."

It would indeed require the pen of one far other than myself to describe the delights of an entomological excursion, such as an entomologist only knows.

Does our whole pleasure consist in capturing insects, and placing them in our cabinets? There is certainly a great pleasure in this, but this is not all. It is the association of the sights and sounds of nature that makes it the enjoyable pursuit it is. An entomologist, remember, in his rambles sees some of the prettiest and finest sights of nature in the wood, in the glen, and on the mountain; and he has also ample opportunities for studying nature in all her various forms.

It is a good thing to use a note book pretty freely when on our entomoligical rambles, noting down to as great a degree as we are able the habits and localities of the insects, and those of you who try this will find that by the end of a season, not only have you collected a store of knowledge far more valuable to you than any that you could obtain from books, but also that you have compiled a little series of notes, really interesting to a casual reader. In such a way as this was "White's Selbourne" compiled. We cannot all hope to be Whites and we cannot all hope to live at a place so full of interest to the naturalist as Selbourne appears to have been, but we all can hope to got together by keeping up such a practice a very interesting series of notes.

The rest of the "cooking" is known to all before me either from personal experience, or from seeing other people perform the office, viz., the setting and drying of the specimens we have obtained. For this a contrivance termed a setting-house, is very convenient, being a small square box, with a door to it, and grooves for the setting-boards to run in. This is a cheap contrivance and saves the specimens on the boards from much knocking about that they would be otherwise exposed to. I will speak of cabinets presently.

We have all this while been talking of supplying our cabinet by simple hunting for the specimens we needed, trusting to our legs; but science has placed other means within our power. "Purple Emperors," for example, may be captured by placing meat to decay near their haunts; besides this I will give two other instances. There is (i) a way that has become known to us of obtaining the males of some of the large *Bombycina*, especially of the "Oak Eggar" (*L. Quercus*) and "Kentish Glory" (*E. Versicolora*). It is this. If a female of either of these species be taken in a caterpillar cage or even in a box, to a wood in the evening the males of the species, if any are near, will flock to the female, and thus fall easy victims to the entomologist.

Number ii applies simply to the *Noctuæ* or night moths. It is what is familarily termed "sugaring," and consists, in spreading on the trunks of trees in the evening a glutinous compound of treacle, sugar, beer and rum. A large majority of the *Noctuæ* and even some few *Geometræ* flock to the sugared tree in great numbers if they are placed in favourable situations. Now both the situation of the tree sugared and the night chosen for the undertaking have a great deal to do with the amount of insects we obtain. The trees chosen should be, if possible, in the siding of a wood standing out a little from the undergrowth at the side. Sugar those that are surrounded by blossoms, for the moths coming to their old haunts to suck the nectar from the flowers are attracted thence to the sugar. As an instance, there was one tree in particular last summer in a wood near home, at which on one night I counted eighty moths; whereas at other trees only four or five might be seen and this I can only account for by the blossoms that surrounded the tree. The fact of their being on the outside of the wood seems to influence the productiveness of some trees to a great degree. As to the height one should sugar, that must be left entirely to the opinion of the sugarer for he must regulate the height by the surrounding undergrowth. The lantern when reflected to the tree should always be at a distance for nothing tends to frighten the insects off more than a sudden glare of light. The best method for taking the moths off the sugar is to put them in separate pill-boxes, for by this means a practised hand can take nearly every specimen in succession without frightening off the others. A net should be carried, as it may always be required:—As to the night, a warm cloudy night I have found by far the best, on a moonlit night we can hardly expect to get one.

We have now finished the ways and means of capturing the insects in the perfect state; there yet remains (i) Pupa-digging, and (ii.) larva-rearing. By the former of these means I have heard competent people declare that they had obtained some of the very best insects they possess, but this means of obtaining insects requires one great quality—patience.

In the dry holes of elm and other large trees a great number of *Noctuæ* chrysalids may be found. Not all holes, mind, have these chrysalids in them, only those which are placed in such a way as to escape the wet in winter. I subjoin a tabular account of the chrysalids taken by myself last winter to show the most productive trees.

Elm	37	Sm. Tiliæ iii. Noctuæ xxxii. Geometræ ii
Oak	8	all Noctuæ
Chesnut	7	all Noctuæ
Beech Lime	3	all Noctuæ
Apple Willow Ash	1	Noctua Bombyx (under bark) Sphinx Ligustri

The most I have ever taken from one hole is 9. The trees which seem most productive are moderately large ones which have the ground raised round them; as they get into as dry ground as they can; and the species of tree, elm, in the holes in which dry earth has accumulated.

A small spade is the best instrument to use for digging, and you should dig close to the tree for noctuæ chrysalids, but should you have the good luck to hit on a hawk-moth chrysalis it will be some four or five inches away. The trees you should choose should be if possible in a row and of very large size. I have always found this kind of parklike ground on a hill, where there are many large trees in a row, by far the best. Chrysalids may also be found by looking under moss, and under the bark of willow trees.

These chrysalids, when obtained, can be kept in earth at the bottom of a common caterpillar cage, but the earth must be moistened occasionally, else the insects will be shrivelled up.

(ii) Larva Rearing.—I need not say much under this head. That Larvæ should be kept well supplied with food is essential to rearing them well. The best way for obtaining them is by placing an umbrella under a bush and beating violently; in this way many small larvæ which would otherwise escape detection are seen. These should, as before said, be carried home in a small tin for the purpose of keeping them cool.

So much for the catching and killing of lepidopterous insects. Now for the arranging. They may be arranged either in cabinets or boxes according to the wish of the owner. People have different opinions regarding collections. Some classify them, others have historical collections. A collection according to classification I need not describe, but an historical one is very interesting being (1) the larva, (2), the pupa, and (3) the imago of each species. The great difficulty here consists in the stuffing of the larvæ which cannot be well done till after considerable practise; while the London Naturalists charge enormous prices.

The way however is to cut a little slit in the skin of the caterpillar near the tail, to press the inside out, and then, having placed the skin over a hot stove, to blow gently into it through a straw. The skin being inflated with hot air swells to its natural proportions, and if left a sufficient time over the stove dries in that shape.

Here I may make a remark which applies both to pupa digging and larva rearing. If, as I supect most of us do, we keep our chrysalids in a caterpillar cage, when they come out in all their new born glory ready to adorn the series in our cabinets, their is some difficulty in killing them without rubbing off the scales. First of all we should try to pin them, but if we think we cannot pin them straight, or that we shall damage them, I would recommend a net on this principle: get a short piece of stick; bore down it with an awl from the top; at about ½ inch from the top bore a hole in the side meeting the other; pass a piece of thin wire (doubled) through the side hole and out at the top, from which, when it is drawn out it forms a loop; on this stitch a small bag and it is complete.

It acts thus: place the mouth of the net over the insect in the cage; coax it to enter the net and then by simply drawing the wires the net is tightly closed and our friend is a prisoner.

With the collection should be kept a note book, in which should be inserted the date and locality of capture with remarks of every rare species we possess. A collection might be for the sake of appearance, like Indian moths arranged in glass cases, but exposure to the light would soon fade them and render them worthless or nearly so.

Thus have I gone over the rudiments of entomology, and I only hope I may induce others to study a science at once so beautiful and so interesting, which will not only reward them amply for their pains, but will also give them an insight far beyond what they expected into the beautiful walks of nature.

H. C. Spry and H. R. Clarke were elected members, and H. Manders was re-admitted.

There were 61 persons present, 2 hon. members, 22 members, and 37 visitors.

MEETING HELD APRIL 30TH, 1869

There were no exhibitions in order that there might be more time for the Lecture, which was given by J. Walker, Esq., M.D., on the Nervous System in Man. The Lecture was illustrated by numerous specimens, models, and diagrams. The following is an abstract of the Lecture.

THE NERVOUS SYSTEM OF MAN.

I do not intend to go into the vexed questions that this subject may give rise to, but simply in as plain language as possible to describe the two great nervous centres of man, viz., the spinal cord and brain and the Sympathetic system, and how the entire frame and mechanism of our body is governed and controlled by its influences. To commence the task, I must set in motion, and that very freely too, the occupant of four walls. I mean the resident of my mouth in the shape of my tongue, and to do this I must call into great activity the grey matter of my brain, which is composed of *vesicles*, small bladders or cells. These vesicles stimulate the nerve *fibres* of motion, which pass from my brain to my tongue and give it the power of movement. The tongue, as you know, is composed entirely of muscle, several united together, and held in position by attachments to the floating bone in the throat called the *hyoïd* bone.

We have in our body two kinds of muscle, voluntary and involuntary, of which the former is governed by the *Brain*, the latter by the *Sympathetic system*. The tongue is composed of voluntary muscle. We must *think* before we can speak, and when we have thought, the nerve fibres, running from the brain and thence to the tongue, will stimulate the muscle and set it in motion. This, then, brings into activity two kinds of nerve tissue and two kinds of nervous power are therefore exerted in the movement of the tongue.

Occasionally, I presume, many of you are accustomed to use the boxing gloves. You must think before you can strike, and two nerves are thus called into action; but if successful in your striking and your fist should happen to come into contact with your opponent's head, your fist will soon feel the effect of the concussion, and that through *another* set of nerve fibres, which pass from the hand to the brain, and are called nerves of *sensation*. These fibres are quite separate and distinct from the fibres which carry the stimulus from the brain to the muscles.

Some few of you present have felt a large lump at your throat, a thumping at your side when you have first presented yourself before the Master for a *vivâ voce* examination. I can fancy I hear you saying "I *will* be brave, my heart shall be still and quiet, and that lump shall get smaller;" and in many instances by a great effort, you can control in a measure the excitement you are suffering from. The heart is your great trouble: its increased action is due to the nerve fibres that are connected with the brain, and the excitement of the brain causes its increased action. But however much you desired to stop its action, positively you are powerless to stay its onward beat; and why? because the heart is composed of involuntary muscle, that is, muscle that receives its stimulant from the *sympathetic* system, which is contained in the body and lies *on* the spinal vertebræ.

This system governs the contents of the chest and abdomen, the heart, the lungs, liver, stomach and intestines, and the bladder. This nervous system never rests, but is always in action day and night; in sound and deep sleep the brain is regaining its lost substance, and the sympathetic system is therefore as necessary to us when in bed as when at our daily work. I shall presently show you how intimately the spinal cord is connected with the sympathetic and yet how entirely they are separated from each other.

Suppose I fold my arms and resolve to hold my breath; how long can I carry out that resolve? only for a few minutes. You can estimate its duration if you have ever tried to dive under water. The muscles of respiration are governed by nerves that spring from the spinal cord, they are voluntary muscles, but from the instant you commence holding your breath, an ever increasing desire compels you soon to relax your intention; why? Because breathing is necessary to life, and the lungs are, therefore, supplied with nerves from the sympathetic system, whilst the muscles of respiration, which are very numerous—all the muscles below the lower jaw and above the hip being called into action in respiration—together with those of the extremities, the arms, legs, and hands, receive the nerves of motion from the spinal cord. In a word, organic life is governed by the sympathetic, and animal life, by the brain and spinal cord.

To recapitulate—The brain is composed of two kinds of tissue, one cellular and of a grey colour, the other fibrous and white. With the former we *think*, and with the latter we *move*. Every motion of the body, whether it be a movement of the finger, a nod of the head, a step in walking, or rising from your chair (which will bring nearly all the muscles of your body into action) all require thought, and the stimulus will be carried from the brain by the nerve fibres of motion to all the muscles.

In this statement I can easily understand you to express some doubt. You may reply "suppose a schoolfellow gave my leg a prick with a pin, I should quickly move and that without thinking." This movement would be due to simple *Reflex Action*, as the point of the pin, to produce pain, must come in contact with a nerve of sensation. The fibres of this nerve would carry the sensation to a nerve *ganglion*, or nerve centre. The sensation will immediately pass from the nerve centre in two ways, one upwards to another nerve centre and so on to the brain, the other at the same moment through a motor nerve to the muscles of the part pricked, and so produce the movement of the leg.

To illustrate this more fully, we may see the various modes in which a nerve may act in the case of the eyelids: 1st there is the *simple reflex action.* If when the eyes are open, a fly touches the lashes, immediate blinking takes place. Here the impression of contact is conveyed through the sensory fibres to the ganglion at the base of the brain, and a motor impulse is directly propagated to the muscles of the eyelid and so produces blinking. 2nd Blinking occurs though a person may be in a state of half sleep or somnambulism, or rendered partially insensible by chloroform; this would be due to *sensory motor action,* the stimulant and the propagation both coming from the brain. 3rd Blinking and winking are often seen in Hysteria, when persons are fainting; this is due to *emotional reflex action,* and 4th, we can wink and blink *at will,* that is, if we propose doing so, we must think before acting.

Before entering into any particulars of either of the two systems of nerves, allow me to say that all nervous substance is vesicular or fibrous. The vesicular is made up of cells, which may be spheroidal, fusiform, corodate, stellate, or almost any variety of shape; the fibrous consists entirely of nerve fibres, the most perfectly developed form being tubular. A nerve centre may be small or large, but must be composed of vesicular and a complemental part fibrous tissue: the vesicular to originate changes, which it is the function of the fibrous to conduct. In reading various authors on Physiology, please remember that one difficulty you will have to encounter is the different names that various authors give to the same substance; but by whatever names nerve centres are denominated, the *structure* can never be altered. Cells are the basis of large nerve ganglia and fibres are the connecting media from one ganglion to another, and to all structures of the body. When speaking of a nerve, say, for instance, in the hand, the nerve spoken of may comprise many fibres enclosed in a smooth transparent membrane, and several of these "funiculi" are again bound together in areolar tissue and enclosed in a sheath of yellow elastic fibres. In the same sheath are found fibres which convey sensation to to the brain (called the afferent or centripetal nerve) and those which convey the impression of the brain to the surface of the body, (called the efferent or centrifugal nerve). You may compare an afferent or an efferent nerve to a submarine cable, the centre of the cable would be the axis cylinder of the nerve, the non-conducting gutta percha coating the fatty matter of the nerve, and the external coating of hemp the *neurilemma* or exterior covering of the nerve.

I will now show you the position of these nerve centres. First, then, as you are all well aware, the bones of the skull enclose the brain, and as soon as the brain passes out of the *foramen magnum* (the hole in the skull above the backbone) it becomes the spinal cord. The spinal cord and brain are only different parts of the same system and are continuous, the division only being arbitrary. The brain is, in fact, the outgrowth or an expansion of the spinal cord. To the divisions and subdivisions of the branches of these large nerve centres I shall be only able to give a passing thought. You can see how each part of the human frame is supplied with nervous power by casting your eye over the diagrams in which the nerves are shown by white lines.

The brain and spinal cord are covered with three membranes, the *Dura Mater*, *Arachnoid*, and *Pia Mater*. The dura mater is a strong fibro-serous brane covering the inner surface of the bones, and acts as the *periosteum* (or membranous covering) of these bones. It folds upon itself in various parts and forms canals for venous blood, the passages for the return of the blood from the brain. It also passes between the two hemispheres of the brain, that portion being called the *Falx cerebri*. Another portion, called *Falx cerebelli*, similarly divides the *cerebellum* or smaller brain. These portions prevent oscillation of the brain from side to side. A third portion is stretched from side to side of the skull and attached firmly to the bone supporting the cerebrum and acts as a tent to the cerebellum.

The Arachnoid membrane is a thin glossy membrane very much like gold beater's skin. It is double, bends back upon itself, and thus becomes a shut "Sac."

Between the two layers a space exists, which contains fluid, this fluid prevents concussion of the brain, and also the Dura Mater and Pia Mater from rubbing together and thus by friction injuring each other.

The Pia Mater is a highly vascular membrane, the nourishing membrane of the brain. It derives its blood from the internal carotid and vertebral arteries. The branches of these large arteries form a circle, called the Circle of Willis, at the base of the brain. The brain is the largest nerve centre in the body, it is composed of the *cerebrum*, *cerebellum* and *Pons Varolii*. The size of the brain appears to bear a general relation to the intellectual capacity of the individual. The brain of many of our clever men has weighed 63 and 64 ozs., whilst the brain of an idiot will only weigh 28 ozs. The brain of men of average intelligence will weigh 48 ozs. and of women 5 or 6 ozs. less. Male minimum 34 ozs.; Maximum 65 ozs. Female minimum 31 ozs.; Maximim 56 ozs. Two substances only as yet have been ascertained to enter into the substance of the brain and spinal cord. The Grey or vesicular, as I have told you, is formed of cells of all shapes. The White or medullary of fibres passing some transversely, others ascending and others again descending and interlacing with each other.

The cerebrum is the largest division of the brain, it occupies the entire length of the skull and is separated from the cerebellum by the tent of Dura Mater. It is divided nearly through its entire substance by a longitudinal fissure separating it into two hemispheres which are united by the *Corpus Callosum,* the great transverse *commissure* (or band of union) of the brain. The upper surface is convex, of an ovoid form, and presents a number of convoluted eminences separated by depressions called *sulci.* The depth of these sulci varies very much in every brain and also in the same brain: the higher the eminences and the deeper the sulci the greater will be the external surface and the larger the surface of grey matter.

I told you the size of the brain determined the mental calibre, but we must modify that general statement by noting the fact that the brain must be in proper proportion, the cerebrum bearing a relative size to the cerebellum—again if the brain is large but the eminences slight and the depressions shallow, the fibrous portion will be in excess and the purely intellectual less, therefore it is not always the size of the brain that will determine whether a man shall be a scholar or a fool, but rather how each part is developed; the brain can be brought to a high state of development by exercising it equally, as muscle can by training and use. The number and extent of the convolutions, increase and become more complex as we ascend from the lowest class of Mammalia up to Man. In children the convolutions are few, and the depressions very slight, but as the child increases in mental power the surface of the brain becomes more irregular; and assumes its deepest sulci when the child arrives at the prime of life. But as the full grown man descends the ladder of life the outer surface of the cerebrum attains somewhat the appearance of early life, the convolutions become much less marked, the eminences flattened, and the sulci less deep.

The under surface of the cerebrum is more uneven than the superior. Both hemispheres are divided into 3 lobes, anterior, middle, and posterior; the lobes are divided by fissures, each bearing a name, but as the nomenclature of the brain will little serve my purpose this evening I shall omit as much of it as possible.

The cerebellum or little brain is situated in the Inferior Occipital Fossa between the two Posterior lobes of the cerebrum. It is about five or six ounces in weight. The proportion between the cerebrum and cerebellum is 1 to 8½, the cerebellum attaining the larger size in the female than the male. In form the cerebellum is oblong and flattened from above downwards; it measures transversely from three to four inches, two to two and half from before backwards, and two inches thick in the centre.

The surface is not convoluted like the cerebrum but transversed by numerous curved furrows. It is divided into two hemispheres united by the *Vermiform* process. Each hemisphere is again divided into an upper and lower portion by the great horizontal Fissure. From this primary fissure other small fissures spring which divide the little brain into lobes, seven in number. Two above and five in the under surface. The grey matter is darker than that of the cerebrum and is situated on the outer surface.

The Spinal cord very much resembles the brain proper. It is enclosed in bone walls, the vertebrae, and is covered by three membranes and held in position by a ligament made of an expansion of the Dura Mater. The spinal marrow is firmer and more pliable in texture than the brain, and thus easily adapts itself to the curves of the spinal cord. It extends from the base of the brain to the pelvic bones. The cord is nearly divided in the centre by an anterior and posterior fissure the two halves united by a commissure of white matter. Each half is divided into three columns anterior posterior and lateral. The Grey matter is enclosed *within* the white and assumes a peculiar shape. Each nerve arises by two roots, one root from the anterior column, the other from the posterior, the posterior as soon as it leaves the foramen of the vertebrae forms a ganglion with the sympathetic. The fibres of the anterior *pass* the ganglion and then unite with the posterior. These nerves thus produced unite and form Plexuses or networks.

Mr. Brown Sequard has given 20 years study to the fibres of the spinal cord and brain and he has now demonstrated to the satisfaction of many that the nerve fibres of *motion* pass upward on the side of the spinal cord from which they spring to the under surface of the Medulla Oblongata and then all the fibres cross over to the other side in a bundle, but that the nerve fibres of *sensation* pass over to the other side direct: the same arrangement of nerve fibres exists on both sides of the spinal cord and you must please to remember that in describing the arrangement and distribution of one side the opposite side is always in harmony. Mr. Brown Sequard states that if you could divide the spinal cord downwards from the fifth cervical vertebra in the median line you would only affect the sensory nerve of man and not his motor power, that is he would have the ability to walk but that you may cut and slash him about and he would experience no sensation.

There were 77 persons present. 3 Hon. Members, 26 Members, and 48 Visitors.

MEETING HELD MAY 14TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

Model of a canoe and ornament from the head of a canoe from the Feejee Islands, and a couple of grass cloaks from New Zealand, by W. S. Bambridge, Esq.

A collection of minerals and ores from the Botallac mine in Cornwall by W. H. Borlase.

Specimen of Stigmaria from the Forest of Dean by Mrs. Jones, Marlborough.

Fossils from the Lias near Cardiff, by G. E. Manisty.

Specimen of Malachite, by H. J. Verrall.

A long list of Ornithological and Entomological notices was passed round, the most important being the capture of *P. argiolus*, by B. J. Fuller.

Collections of coins by M. H. Smith, E. A. Furneaux, and the Rev. C. Soames.

EXHIBITIONS:—A box of moths captured this year by H. M. Hilton.

Specimen of silk-cotton, by H. J. Verrall.

G. C. Mansell was elected a member of the Society.

The following paper was read by W. D. Fenning, on

THE ANTIQUITIES OF MARLBOROUGH.

I AM aware that I may be accused of plagiarism in treating of this subject. I must therefore at once confess my obligations both to Dr. Cotton's lecture and to two papers read here by Dumergue. But Dr. Cotton's lecture was delivered more than fourteen years ago and is now out of print; therefore I suppose but few of you are acquainted with it. Besides I intend to take a more extended and more general view than either of my predecessors.

Of course I shall begin with the college. Neither "A" nor "B" houses, nor in fact any of the buildings except the Old House can lay claim to antiquity in the smallest degree. I shall therefore speak only of the Old House, which was built by Inigo Jones the architect of Whitehall, Wilton House, Ramsbury Manor, and many other fine buildings. My readers probably know as well as I do the various legends connected with it, the C. House Ghost, and the mysterious underground passages which are said to have their exit in the forest, but which I believe have never been discovered. The finest room in the Old House is the library, originally two rooms, but thrown into one to form the first dining hall of the New College, and since transformed into a Library. One of the most noticeable points in the building is the elevation of the rooms. Though not so well suited for many reasons to its present use as the new houses, it is the only portion of the college buildings except perhaps the chapel, that has any pretensions to architectural beauty.

We now come to the mound. It was probably raised by the Britons as a tomb, and was intended to match Silbury Hill, as they are both situated on the Kennet and were evidently once of nearly the same size. It afterwards supported the keep of Marlborough Castle, was then laid out in terraces, and adorned with grottoes, some of which still remain. It is now used as the College reservoir for which its height admirably adapts it. The bathing place is probably part of the old moat. Marlborough boasts a High Street, broader, I believe, than can be found in any other provincial town in England. Every visitor is astonished at its breadth. Taken all together it is also a picturesque street: true, the barbarous restoration of the Town Hall is a great misfortune, as all who remember the old building must admit; but municipal bodies were never famous for good taste. There are still, however, many very nice old houses; there is for instance the one occupied by the late Mrs. Emberlin and Mrs. Bane, which but that the latter has put large panes of glass into the windows is a splendid specimen: the interior too corresponds, and the staircase is very fine. There is a nice looking house again in the street leading from Kingsbury Street to the Green, though I dare say but few of you know it: Mr. Avery's too, and many others are decidedly better than the common run. The penthouse again is unusual; by the penthouse I mean the verandah that stretches from just above the Royal Oak to the end of the High Street.

Leaving the town we will first take all the Roman remains in the neighbourhood. The first of these is the small camp on the common at the corner nearest the town which is used as a cricket ground by the youths of the town of Marlborough: its shape is oblong, and here I may as well remark that all true Roman camps are either oblong or square, and have but a single vallum, whilst British and Saxon works are of irregular shape, generally following the outline of the hill on which they are situated; a double or triple rampart is a proof that Saxons have either built or at any rate made use of the camp. All that we know of the one in question is that it was probably an appendage to the Roman Station Cunetio: about the exact site of the latter there has been much dispute, some placing it at Mildenhall, others at Folly Farm on the left hand of the Hungerford road, just before it enters the Forest: Sir Richard Hoare believes that these were two stations, which he calls Upper and Lower Cunetio. Several Roman roads met at one or other of these two stations: one ran very much in the line of the present Bath road, but it cannot be distinguished on this side of Beckhampton: there is another however which may easily be perceived by any one who is sufficiently energetic to look for it. Follow the road that passes Rabley copse till you come to a sign post standing by itself on the downs. Here take the turning to the left which is actually the track of the old road. After following this for about a mile you will come to the top of a hill, overlooking the two Ogbournes. From this point the course of the Roman road may be very clearly seen, running almost in a direct line through the further Ogbourne to Chiseldon. The Romans always made their roads as straight as possible and often carried them over steep hills, when a very slight detour would have enabled them to keep to the valleys. In the present case, however, the road does not meet with any very steep hill, and for this reason the old track was used when the New Swindon road was formed. This, I believe, concludes the list of Roman remains in the neighbourhood. We will now turn to those of British and Saxon origin.

One of the most interesting places within easy walking distance of Marlborough is certainly Martinsell Hill, or as it is more commonly called Martin's Hill, not only for the British remains to be found there, but also for the beautiful and extensive view to be obtained from its summit. The prospect extends over what is generally known as the Pewsey Vale, which divides the Marlborough downs from Salisbury Plain. A long narrow spur runs out on the South west side of the hill, and in the hollow between this and Oare Hill is Rainscombe park, which is very prettily situated with the wooded slopes of the hill on three sides of it. On this narrow spur formerly stood a summer house which was blown down some years ago, but the place is still called Summer-house hill. From this point may be seen Wilcot Hill and Woodborough Hill both remarkable for their curious conical shape, and St. Ann's Hill or Tan Hill where a large cattle fair is held in August. Before leaving this part of the subject I may mention that Martinsell Hill is the highest chalk hill but one in England. Inkpen Beacon near Hungerford is the highest.

To consider the hill now archæologically. As you reach the top from Clench Common, you will see on your left and a little below you a number of mounds and hollows evidently not formed by the hand of Nature. These are generally considered to be the remains of a British Village. The dwellings of the early Britons were merely holes in the earth, thatched over with boughs and brushwood. We have no evidence of brick or stone being employed, so we need not look for any remains of walls or foundations.

It is also possible to trace a sort of street running through these pits and there is a curious winding road leading down to the bottom of the hill.

Above the "village," and crowning the hill is a large fortification of an irregular oblong form. The rampart surrounding it is not so strong as we find in many similar fortresses, but the natural advantage of such a commanding position would fully compensate for this defect. These hill fortresses, were probably not used in time of peace, but when a tribe had to go out to war they would leave their women and cattle in these strongholds with a small garrison. Observe that this rampart is a single one which shows that it was raised by Britons.

The next British work which we will consider, excels even Martinsell in interest, I mean Avebury, or Abury as it was formerly called. The shortest and pleasantest road to it is past the Devil's Den, through the valley of the Grey Wethers, and across the Downs to the left. This "Devil's Den" is a Kist-vaen, and probably the tomb of some British hero. It consists of one large stone, ten feet by eight, on the top of two smaller upright stones. The whole height is about ten feet. There were formerly two similar monuments in the same valley but they have been broken up by the farmers. Leaving this you come to the Grey Wethers or Sarsen stones interesting not only to the Geologist, but also to the archæologist, for of them are composed Stonehenge, Avebury and the Devil's Den. Certainly they strongly resemble a flock of rather large grey sheep browsing over the valley. Passing over the downs you come to Hackpen Hill, from which a general view is obtained of the village of Avebury encircled by the rampart, though it is hardly a rampart, properly so called, as it was not intended for purposes of defence, which is proved by the ditch being on the inside. I will now describe the plan of the temple as it originally stood. In form it was circular, surrounded by a very high bank of earth which was probably cut into terraces or seats for spectators. Immediately inside the bank, separated from it by the ditch, was a line of large upright stones a hundred in number. Within these were two smaller circles, side by side, now called the Northern and the Southern Temples. Each of these smaller circles was double, and had three large stones for a centre, called the "Cove:" the other had but a single one, which was, however, of enormous size, larger than any of those at Stonehenge. There were two avenues of stones leading to the temple. One started at Kennet, where there was a circle of smaller stones, and where probably the dwellings of the Druids were situated. The other extended to Beckhampton and terminated in three large stones. The two avenues together, being of winding form, have been considered symbolical of a serpent, having for his head the small circle at Kennet, and for his tail the three stones at Beckhampton.

The Beckhampton avenue is now almost entirely destroyed, and but few stones remain of the other. Of the temple itself there are so few traces remaining, that, had it not been for the researches of Dr. Stukeley two hundred years ago, we should still be in ignorance of the original design and plan of the work. Thus the unfortunate position of one wretched little village within the area of the temple has almost entirely destroyed this most magnificent evidence of the perseverance if not of the art of the ancient Britons.

With regard to the purpose for which it was raised, opinions are much divided; but it was probably a general gathering point either for some sort of Congress or Parliament, or for some great annual religious festival.

All who visit Avebury must notice Silbury. It is a large mound or small hill on the north side of the Bath road between Kennet and Beckhampton, and can be easily seen from Avebury. No one can fail to perceive at first sight that it is artificial. The diameter of the base is 552 feet, that of the top 104 feet, and the height 130. As I have mentioned before, it corresponds to our own Mound, which however is its inferior in size. Several extensive excavations have been made in it, but no traces have been discovered of the tomb which it most probably contains. There are several of these huge mounds scattered over every quarter of the globe, and most of them have been found to contain tombs which however do not always occupy the centre of the mound. There is a tradition that a man and horse, life size, and formed of solid gold are hidden in the interior of the hill. He will be a very lucky man who finds them.

We will now turn to the Wansdyke. This is a huge barrier stretching from the Severn to the Thames, and is more than eighty miles in length. The ditch is north of the rampart, so that the earthwork was made for the defence of people living to the south. It is constructed of two layers one added evidently long after the other, and this seems to point to the theory that it was originally constructed by the Belgæ, and afterwards strengthened by the Saxons. The name is most likely a corruption of Wodin's Dyke. It is easy to strike it from here. On the road to Martinsell there is as you all know a clump of firs just before you come to the railway. Through this clump the Wansdyke passes, but here the rampart has sunk considerably, and the ditch is very much choked up. The nearest point where it can really be seen to advantage is on Tan Hill where its appearance is very imposing.

Connected with the Wansdyke is the camp of Chisbury, near Bedwyn. It is of oval form surrounded partly by a double, partly by a triple rampart, and contains nearly fifteen acres. It is situated on a rising ground to the north east of Bedwyn. The road to it through the Forest is very pretty and well repays a walk. Chisbury has been proved by excavation to have been originally a British camp, but the double rampart shows that it was afterwards used by the Saxons. We are told that a great battle was fought here in 695 between two Saxon Kings. It derives its name from the Saxon Cissa, who took it from the Britons and made it his stronghold. Within its area is a small chapel, dedicated to St. Martin, now used as a barn. It is in the decorated style, and is mentioned at the beginning of the 14th century. The ramparts are in some parts thickly covered with trees and bushes, and the ditch between them is filled with water, which however was not intended to be there by the founders of the camp, moats being a Norman invention. While speaking of Chisbury I may as well mention Bedwyn, which is a small town, remarkable for nothing but a fine old collegiate church, and a curious Town Hall. The latter building is supported on wooden pillars, which are now in a very rotten condition, and should be replaced by new ones before they cause the destruction of the edifice.

Before leaving the subject of British remains I must not forget the tumuli which are very numerous on our Downs. They are of various forms, some round, some oval, and some of larger size, surrounded by a small ditch. Many of them have been opened, and pottery, flint implements, etc., found in large quantities.

Besides Chisbury, there are three other principal Saxon camps in the neighbourhood, Oldbury, Barbury, and Liddington. The first of these is on a hill overlooking the Bath road about nine or ten miles from here and is rendered conspicuous by the large obelisk erected there by the Marquis of Lansdowne. This obelisk is easily seen from our Cricket ground or from any high hill about here, though it hardly looks so far off as it really is.

Oldbury camp is of very irregular shape, following the windings of the crest of the hill. On the side nearest to Calne the slope is very steep and a white horse in a trotting attitude has been cut out in the turf. This animal is called the "Cherhill White Horse," and is much stouter and stronger built than its Marlborough rival, and, if I remember right, is better groomed and kept clean. I may add that, like most of these hill forts, Oldbury affords a magnificent view extending over the beautiful country about Calne and Bowood.

The remaining camps, which with Oldbury formed part of a long chain of hill forts, are Barbury and Liddington, the former of which you reach by the old Swindon road, the latter by the new. They are very similar; Barbury is rather the larger and stronger, the circuit of the ramparts being about half a mile, and their height forty feet. The Saxon Chronicle has recorded that in the year 556 "Cynricus et Ceawlinus acrè dimicabant contra Britannos ad Berenbyrig." Berenbyrig is probably Barbury.

I have now I believe mentioned all the ancient works in this neighbourhood. Every one of them is well worth seeing and none are hard to reach, if the archæologist will only make good use of his legs. In conclusion I must refer those who wish for fuller information to the valuable works of Sir Richard Colt Hoare, and to several papers and pamphlets by the Rev. A. C. Smith.

There were 36 persons present: 1 Hon. Member, 21 Members, and 14 Visitors.

MEETING HELD MAY 28TH, 1869.

There were no exhibitions, in order to give more time for the lecture, which was given by F. Giles, and illustrated by experiments, on Statical Electricity.

E. Owen and E. A. Champneys were elected members.

There were 80 persons present: 1 hon. member, 23 members, and 56 visitors.

MEETING HELD JUNE 11TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

Some coins by W. G. Fellowes.

Key of the Old Marlborough Castle, by Mr. Wooldridge.

A typical series of bird's heads, twelve in number, among which were those of the Snipe, Water-rail, &c., by G. E. Manisty.

A special vote of thanks to the Rev. C. Soames was proposed by the President and carried unanimously.

The Heads of Sections gave their reports for the half-year.

E. F. Vicars was elected a member.

The following paper was read by R. Rocke, on

THE PLURALITY OF WORLDS.

SOME of you may remember the words of Shakespeare on this subject, for he has written upon this, as upon all other things. Lorenzo and Jessica are standing together in the night, and Lorenzo speaks these words to his love:

> "How sweet the moonlight sleep upon this bank
> Here will we sit, and let the sounds of music
> Creep in our ears; soft stillness, and the night
> Become the touches of sweet harmony.
> Sit Jessica. Look how the floor of heaven
> Is thick enlaid with patines of bright gold.
> There's not the smallest orb which thou behold'st
> But in his motion like an angel sings
> Still giving to the young-eyed cherubins:
> Such harmony is in immortal souls."

Such was the verdict of what I may call poetic intuition, unassisted by science, and when, with fresh improvements of the telescope, new worlds and new systems of worlds, as it seemed, were revealed to the eye, how could science fail to strengthen the verdict of the imagination? Whether it did so or not, is the question which I have to discuss to-night, but one great step had been gained, the Plurality of Worlds was no longer a subject for idle dreaming, but for real and carefully tested knowledge.

There are two methods by which we can examine a question of this nature. We can look at the world around us, with which we are aquainted and on which we can form comparatively certain opinions: if we can find any operations in Nature, which seem similar to those of which we cannot as yet determine anything with certainty, we can apply our knowledge of discovered systems and facts upon the Earth to similar systems, as it would seem, in the Heavens, and by thus comparing the unknown with the known, we can deduce results of which we should otherwise be ignorant. This is called the Argument from Analogy. It is obviously insufficient and liable to advance theories without sufficient *data*; in the absence however of direct evidence, and when used in moderation, reasoning from analogy becomes extremely valuable.

The other method by which we are enabled to pronounce a decision upon the question, with which we are occupied to-night, in our actual knowledge, however confined it may be, of the constitution of the heavens.

Let us first then see what light is thrown upon the question by analogy, and after having proved some principle to be at least *probable*, let us then test it by facts, and if the evidence of facts agrees with our theory, we may safely pronounce it settled, as far as lies in our power.

What then is the main argument, by which supporters of the Plurality of inhabited worlds endeavour to prove their existence? Is it not this? On looking at the sky in the night time, they assert you may see some thousand stars. Use however a telescope of no very great powers, and this number will be indefinitely increased, while a telescope of still greater powers will reveal an increasing number, and, more than this, resolves what seemed before stars, into nebulæ, or vast collections of stars. Many of these, they say, are even of greater magnitude than our sun, and around these suns, no doubt, innumerable systems roll; as far as space can be pierced by the human mind, it would seem to be filled by these huge luminous bodies: knowing all this, how can we doubt that many, if not all of them, are inhabited by living and sentient beings. Is it conceivable that space could be thus wasted? Are all these worlds but desolate wastes, while our own planet alone is inhabited? Such are the arguments, and it must be confessed that they are not without weight, by which the Plurality of Worlds is supported.

But is there nothing analogous on our own earth to this *apparent* waste of matter and space in the heavens? Geology supplies us with a counter argument. For it is now acknowledged on almost all sides that this earth has existed for an innumerable series of ages. It is unnecessary for me to dilate upon or defend this, now certain, theory, except so far as it may enter within the province of our subject to-night. For countless ages this earth was, as it is believed, a globe of desolate fire, inhabited by nothing, and, according to the arguments of our opponents, a waste in the economy of the creation. For ages afterwards it was uninhabited by living beings, or, if inhabited, by creatures of the lowest orders, indeed we may say that for every million miles of *space* which our opponents point to as wasted, we can bring forward a million years of *time* in which the earth was barren of life. Yet it seemed good to our Maker that these countless series of time, which almost madden us when we attempt to realise them, should roll out their appointed course, until this little world was perfected. And if time has thus been lavishly expended in the creation of human men, why should we deny, because it seems strange to us, that space has been filled in the same manner? If man was the object, for which age upon age was spent, why should not our planet in like manner be the centre of the vast universe? And is it not a more reasonable theory to suppose that these stars are worlds in a state of preparation, as our world once was, instead of peopling the universe with dream creatures? But, I confess, that I see no need even for this supposition.

Such then is the argument from Analogy, which Geology gives to us; is it supported by facts? that is to say, would the conditions of life in the planets and stars beyond us be fatal to human beings? Is it impossible that the Moon be after all inhabited by men? Into this question, and it is an interesting one, I will now enter.

Beginning then at the outskirts of Creation let us examine the Nebulæ. For some time the following theory was held with regard to them; it was called the Nebular Hypothesis. The Nebulæ are merely vast masses of luminous vapour, loosely held together, out of which, by the concentration of their substance upon a centre, future suns might be formed.

When, however, telescopes of greater powers were turned upon these mysterious masses of vapour, it was found that nearly all nebulæ were resolvable into clusters of stars of a vast size, and the theory fell to the ground. But when we speak of stars we must clearly understand what the word "star" here means, for it is a term of somewhat indefinite meaning. It would appear that these stars into which nebulæ are resolvable, are of a separable nature, and have run into lumps of light. And when we ask of what substance they are composed, we have one fact, which perhaps may guide us aright. Nebulæ and the tails of comets present exactly the same appearance in the sky; now we have ascertained that tails of comets are luminous vapour, and it seems highly probable that this is the substance of which the stars of the nebulæ are composed.

The nebulæ therefore would appear to be long patches and streaks of a matter which is altogether incoherent and gaseous: of immense tenuity, they seem to have no definite system, for the rolls of vaporous matter vary exactly as columns of smoke, or the changing clouds of an English sky. No greater contrast could be found than between our solar and the so called spiral nebulous systems. The one, complete in itself and governed by laws of unerring certainty, the others, producers of a confused, incoherent, and indiscriminate matter. On the one hand we look upon order, on the other chaos.

It is therefore obviously ridiculous to people the nebulæ, unless it be with thin and fiery creatures, such as one might imagine to be the tenants of comets, but when it is possible to fill our fires with such beings, why travel to the Nebulæ?

I pass by the Clusters of Stars (which seem to be regulated by the same laws as Nebulæ on a smaller scale, and it is equally improbable that they are inhabited), and before discussing our own system, we will examine the Fixed Stars.

Now it is obvious that if the Fixed Stars are to be centres of inhabited systems, which have not as yet been discovered, they must present a strong resemblance to our own Sun. Is this the case? Do the fixed stars in any ways so resemble our Sun, as to lead us to believe that round them, as round the Sun, roll inhabited worlds?

The first contrast which appears between the two is the series of *changes* which are observed in the Fixed Stars. Sirius, for instance, is at one time of a red colour, at another, white, leading us to believe that this star has even within the range of a thousand years been subject to vast changes of constitution. Still more important is our knowledge that these fixed stars often *vanish*; it has been found that in 2000 years 200 stars change, and therefore in only a million years, 100,000 stars would have altered in their constitution. And what do these facts tell us? Why, surely this, that these stars have as yet not reached any permanent condition, but are constantly liable to such revolutions of nature, as would sweep to the winds any theory of inhabitants, either for themselves, or for their supposed planets.

We now draw near to our own Planetary System. Hitherto we have somewhat groped in the darkness, but it was unavoidable: now we can feel our way with more light and knowledge, and therefore with more certainty.

You are of course aware that our system consists of Planets, of which our own earth is nearly the midmost, and that these roll round the sun, at different distances, and therefore with varying times of revolution. One after the other will be laid before you now, and one after the other will be proved uninhabitable.

But before examining them successively it will perhaps be as well to take one of the most prominent, and shewing the impossibility of any beings, resembling in the least degree human creatures, existing on it, break down the theory that *all* the planets are inhabited.

With this view let us look at Neptune. Its distance from the sun is thirty times that of the earth. To the supposed inhabitants but little sun-light would come, for the sun would look a mere star—what Jupiter seems to us. The modicum of light and heat would be but scanty, $\frac{1}{900}$th of that on the earth. It would seem at least improbable that life could be maintained under these conditions.

We will now strengthen our case by examining the Moon. Here, if anywhere, we ought to pronounce a decisive opinion. So near does the moon lie to us, that astronomers have been enabled to map out her surface as accurately as that of the earth. Ranges of mountains have not only been clearly discerned, but have even been named. We are told that spaces, no larger than our own railway stations, can be distinguished. Of what then does the surface of the Moon consist? Of desolate volcanoes, and extinct craters; of dreary wastes of petrified streams of lava, which flowed forth in former ages. Nowhere are there signs of life, either vegetable or animal: we are not even face to face with the dreariness and silence of death, for life has never existed.

All therefore agree that it would be impossible for such a world to be inhabited. No atmosphere exists which would support them; this is conclusively proved by the absence of all the optical effects of an atmosphere in eclipses; it is therefore hard to conceive creatures who exist without air or water. And lastly, there is one conclusive argument, which destroys the idea, if ever any one entertained it, of an inhabited Moon. Although the surface of the Moon has been observed for hundreds of years, not the slightest change has ever been detected.

Suppose inhabitants of the Moon to have ever existed, and to have possessed telescopes, they would have discerned perpetual changes occurring on the surface of our globe. Now, it would have been the clearing of the huge forests of Germany or of America, now the establishment of the vast manufactories of Birmingham or Manchester, which darken, for miles and miles round, the atmosphere with their columns of smoke. An astromer of the Moon, watching these appearances, would have justly concluded them to have been the production of some living agency on the earth. Unfortunately the absence of all such changes precludes the possibility of observant astronomers in the Moon.

We may now confidently assert that *all* the bodies of the solar system are not inhabited, I will now try to prove that *none* but the earth are.

Commencing with the outer planets we will examine Jupiter. The mass of Jupiter is 333 times that of the earth. His diameter is eleven times greater. His density, however, compared with that of the earth, is only as 1 to 4, that is a quarter lighter. Of what substance therefore can a planet be formed, which exceeds the earth greatly in bulk, but whose material is considerably lighter? In all probability it is water. Other circumstances point to the same conclusion. Jupiter is of an oblate form, that is, that of an orange; now we have all learnt in our Geography Manuals that the earth is to a certain degree shaped in this way, but the oblateness of Jupiter is developed to a far greater extent. This can only be accounted for on the supposition that it is composed of water. For his peculiar form would be produced by the rotation of a fluid mass. There is yet another fact which seems to render this theory irresistible. Astronomers have observed bands of darker and lighter colour upon the face of Jupiter, which change from time to time. They have therefore concluded that these bands are vast volumes of vapour, which arise from the seas, with which Jupiter is covered. Have you ever on a stormy day looked out on the sea, and seen dark angry masses of cloud sweep landward from the ocean? Was not your mind almost oppressed with a sense of vastness? Imagine then these stupendous volumes of mist and vapour rising up ever from the almost limitless waters of the planet, imagine a world wrapped always in impenetrable gloom and darkness, with no sunlight, no day, nothing which makes this world so dear to us, and you will have formed some conception of Jupiter.

Is it possible that such a planet should be inhabited? could the wildest fancy select such a habitation for the lowest creatures? Let us consider a few of the conditions of their life.

Jupiter, though of lighter substance than the earth, has more of it, and therefore his greater mass makes bodies ponderate proportionally more to him. The force of gravity in fact is about 2½ times greater than that of the earth. To lift your leg on Jupiter would require 2½ times the amount of force than on the earth. Your clothes would weigh with 2½ times greater heaviness on your bodies. It is clear then that Jupiter could not be inhabited by any human creatures. And it is difficult to consider what species of animals they could be, when no material as heavy as bone has been found. Clearly skeletons would be out of the question. We can only imagine mere "cartilaginous, glutinous masses" peopling their cold and shiny waters, moving about without animation under the clouds of vapour—such a life for even the lowest creatures would indeed be a life in death.

What is the use then of the Satellites of Jupiter? What was the use I reply of the countless ages in which the earth was uninhabited, of the ages afterwards, when corals and madrepores, shell-fish, and belemnites, were the sole tenants of this fair earth?

The same arguments apply to Saturn. Light and heat are one-ninetieth of the light and heat on the earth. Its density is about that of cork, we are forced therefore to the conclusion that Saturn is only a globe of vapour. Its creatures could only therefore be of a very sluggish nature, so much so as almost to be lifeless. Shrouded by their humid skies their existence would not seem to be of the most enviable. It is extremely problematical whether they could possess eyes, and it therefore idle to join the laments of a supporter of the Plurality of Worlds, who regrets that they would suffer under a solar eclipse for 15 years, owing to the interposition of their Ring between them and the Sun.

But still stronger is the case against Uranus and Neptune, the latter of which we have already discussed; light and heat would in these planets be $\frac{1}{360}$ and $\frac{1}{900}$ of the light and heat upon the Earth.

Drawing nearer to the sun we approach Mars. The density of Mars is equal to that of the earth, but its mass is so much smaller, as to render the force of gravity of Mars half that upon the earth. It would therefore seem impossible that beings, constituted in any way like us could inhabit Mars under these conditions. Yet there are not a few signs that life of some kind may exist upon this planet. Ruddy colours have been observed upon the disc, and it has been supposed that these may be continents. Clouds seem to appear, and then to vanish; brilliant white spots are also seen, which gradually grow less and less as they approach nearer to the sun: astronomers have conjectured from this phenomenon the existence of snow, and for the formation of snow an atmosphere would be required. We have in this undoubtedly a strong case for the possibility of inhabitants on Mars. As I have before remarked, the conditions of gravity and light and heat would render it impossible for human beings to exist upon it. Possibly Mars may be a world in a state of preparation, and, as such, may be tenanted by some unknown monsters as our world once was in past ages. It must, however, be remembered that the evidence, gained from an examination of other planets, seems altogether to negative even this supposition.

Of the small bodies which revolve between Jupiter and Mars little need be said. They appear to be mere crude masses of metal and earth. It is uncertain whether they are even approximately spherical.

Passing still nearer to the sun, we will discuss the planet Venus. Although so near to the sun, astronomers know very little of her constitution. She is almost as heavy as the earth, almost as large. Heat and light would have double the force of heat and light upon the earth. Her surface may resemble that of the Moon, a desolate waste of extinct craters and petrified lava. More probably the fierce ardour of the sun has worn it into a smoothness, of which we can form no conception; the tendency of the action of the sun would be to lower all hills and risings, and to reduce all to one level. On such a planet, life could not exist, it would droop and perish before the withering sun. "Microscopic creatures with siliceous coverings, which are said to be almost indestructible by heat," may tenant the planet Venus, of other inhabitants it is absurd to dream.

If Venus is uninhabitable, what must Mercury be? Far smaller than the earth, it is enveloped by a heat, which is seven times that of the earth. We fear that even the fire-creatures of Venus would not even exist here.

We have now, so to speak, traversed the whole Creation, from the Nebulæ to the Moon. Everywhere we have met with the same result, for nowhere have we seen such indications as would lead us to assume life. The earth, then, would seem to be the only inhabited globe in the universe. Occupying such an all important position, we surely expect to find certain conditions which she alone enjoys, and for which she is dependent on other planets.

These we do find, and in detailing them to you, I may observe that they constitute the "Argument from Design."

From all that we know of the worlds without us, it would seem that water and vapour are driven out from the sea into outer regions of a vast circuit. The Nebulæ are apparently composed solely of vapour, the more distant planets, as we have shewn, of water and ice. On the other hand the solid masses stand nearer to the focus of light and heat.

The earth alone is composed of both solid and fluid. Here alone do we find that nice adaption of air and water and solid earth, which constitutes our globe. A few hundred miles on either side of our present position, and we should be pierced by cold or heat.

You may have observed, when wet objects are placed before a kitchen fire, that the water is driven away from the fire in vapours. It is a homely illustration but in this way the volumes of superflous vapour and water have been driven away from the sun. Instead of wandering about, they have been packed "into rotating masses," they have been wound neatly into balls, for what are these planets and stars but fixed receptacles of vapours?

The Earth's orbit may be called the temperate zone of the Universe. Only here are hot and cold combined, moist and dry, air and water: only here would it be possible for the delicate organisation of human life to exist, only here has man, made in God's likeness, the flower of the whole creation, his dwelling-place, for here alone exist the almost infinite conditions of his life. Instead of making a multitude of worlds, more or less similar to one another, it has seemed good to the Creator to construct *one* world, which it is presumptous in man to call imperfect, since it includes and transcends all that we can conceive of perfection.

Our whole souls seem to revolt at the idea of an infinity of worlds, for it is expressly opposed to everything which either instinct or revelation teaches us. It is as opposed, I believe, to reason. On the earth alone are men ; we stand at the head of the creation ; and although it is impossible to absolutely disprove the wild workings of the imagination on this matter, they are both hurtful to the mind and wholly without reason, for why, when we can people the air and the fire of our own world with the creatures of our fancy, should we travel to the planets, in which we find only indications of a contrary nature ?

I conclude then with the apology of Jewell for his opinions, and it is to my mind one of the masterpieces in our language :—

"It may be that all the other bodies which we can discern in the Universe shew the greatness of this work, and are rolled into forms of symmetry and order, into masses of light and splendour, by the vast whirl which the original creative energy imparted to the luminous element, out of which they were formed. The planets and the stars are the lumps, which have flown from the potter's wheel of the Great Worker ;—the shred-coils, which, in the working, sprang from his mighty lathe ; the sparks which darted from his awful anvil when the solar system lay incandescent thereon : the curls of vapour which rose from the great cauldron of creation, when its elements were separated."

For nearly the first time during the present half-year a discussion arose out of the paper and was conducted with great animation as long as time allowed.

The President made a few general remarks on the state of the Society.

There were 77 persons present : 1 honorary member, 27 members, and 49 visitors.

ENTOMOLOGY.

As usual an asterisk signifies that the species was new to our List. To the name of every insect new to the List is attached the corresponding number in Stainton's "Manual of British Moths."

Names of those whose initials occur :—

A.A.	... ... A. Armstrong, Esq.
H.R.A.	... ... H. R. Armstrong.
E.G.B.	... ... E. G. Barrow.
G.C.N.B.	... ... G. C. N. Bryan.
J.H.C.	... ... J. H. Clarke.
J.G.C.	... ... Mr. J. G. Crow.

W.H.C.	W. H. Churchill.
W.B.D.	W. B. Denshire.
J.B.F.	J. B. Fuller.
W.D.F.	W. D. Fenning.
B.J.G.	B. J. Guillemard.
S.W.G.	S. W. Greenhow.
A.H.F.G.	A. H. F. Greville.
L.H.	L. Hart.
H.M.H.	H. M. Hilton.
A.C.H.	A. C. Hilton.
A.F.H.	A. F. Höffmann.
R.A.I.	R. A. Illingworth.
F.J.H.J.	F. J. H. Jenkinson.
J.A.L.	J. A. Lefroy.
J.F.L.	J. F. Laver.
G.E.M.	G. E. Manisty.
C.G.H.M.	C. G. H. Mann.
H.M.	H. Manders.
W.M.	W. Mansell, Esq.,
J.B.O.	J. B. Oakeley.
R.P.	R. Phayre.
H.A.M.P.	H. A. M. Power.
H.S.G.R.	H. S. G. Richardson.
A.H.B.R.	A. H. B. Reynardson.
S.A.R.	S. A. Rogers.
C.A.S.	C. A. Sladen.
J.S.	Rev. J. Sowerby.
H.C.S.	H. C. Spry.
C.E.T.	Rev. C. E. Thorpe.
J.V.	Mr. J. Velvin.
E.H.W.	E. H. Wyatt.
F.F.W.	F. F. White

RHOPALOCERA.

Name.		*Date*	*Captor.*
Gonepteryx Rhamni	Brimstone	Feb. 5	J.S.; A.A.
		April 5	H.A.M.P.
Pieris Brassicæ	Large white	April 8	E.H.W.; F.J.H.J.
„ Rapæ	Small „	April 13	C.E.T.
		April 14	J.S.
		April 24	R.A.I.
„ Napi	Green-veined	April 27	J.B.F.

Name.		*Date.*	*Captor.*
Anthocharis Cardamines	Orange-tip	April 25	L.H.
Lasiommata Ægeria	Speckled-wood	April 26	B.J.G.—J.B.F.
„ Megæra	Wall	April 30	G.E.M.
Cænonympha Pamphilus	Small Heath	May 26	H.M.H.—J.H.C.
Cynthia Cardui	Painted Lady	May 30	H.M.H.
Vanessa Atalanta	Red Admiral	April 7	F.F.W.
„ Io	Peacock	April 8	J.B.O.—H.M.H.
„ Urticæ	Tortoiseshell	Feb. 21	H.C.S.—R.P.
Argynnis Euphrosyne		May 22	H.M.H. & F.J.H.J. A.C.H. & W.D.F.
„ Selene		June 8	F.J.H.J.
Nemeobius Lucina	Duke of Burgundy	May 26	J.H.C.—H.M.H.
Chrysophanus Phlæas	Small Copper	April 25	C.E.T.
Polyommatus Alsus	Bedford Blue	June 6	H.M.H.—F.J.H.J.
* „ Argiolus (50)	Holly „	April 26	J.B.F.—B.J.G.
„ Alexis	Common „	April 25	G.E.M.—G.C.N.B.
„ Agestis	Brown Argus	May 26	H.M.H.
Thymele Alveolus	Grizzled Skipper	May 11	F.J.H.J.—J.H.C.
Thanaos Tages	Dingy „	May 12	H.M.H.—J.H.C.
Pamphilus Sylvanus	Large „	June 8	F.J.H.J.

SPHINGINA.

Smerinthus Populi	Poplar Hawk	May 24	J.G.C.
„ Ocellatus	Eyed Hawk	June 3	W.B.D.
„ Tiliæ	Lime Hawk	June 9	J.V.
Sphinx Ligustri	Privet Hawk	May 31	W.H.C.
Chærocampa Elpenor	Large Elephant	June 8	C.A.S.
„ Porcellus	Small Elephant	June 11	J.V.
Macroglossa Stellatarum	Humming-bird	April 25 May 7	H.M. G.C.N.B.
Sesia Fuciformis	Bee Hawk-moth	May 23	C.A.S.

BOMBYCINA.

Hepialus Hectus	Golden Swift	June 5	H.M.H.—J.H.C.
„ Lupulinus	Common „	June 5	H.M.H.
Diloba Cæruleocephala	Figure of 8 (larva full grown)	June 9	F.J.H.J.
Porthesia Auriflua	Gold-tail (larva ⅝ of an inch)	May 2	A.H.F.G.
Gnophria Rubricollis	Red-tail (seen)	June 8	F.J.H.J.—H.M.H.
Arctia Caja	Tiger (larva)	April 8	S.W.G.

Name.		*Date.*	*Captor.*
Nemeophila Plantaginis	Wood-tiger	June 2	H.M.H.
Phragmatobia Fuliginosa	Ruby „	April 25	J.F.L.
Spilosoma Menthrasti	Ermine	June 4	B.J.G.
„ Lubricepeda	Buff Ermine	May 21	G.E.M.
Diaphora Mendica	Muslin	May 2	A.F.H.
Callimorpha Jacobææ	Cinnabar	May 18	J.A.L.
Lasiocampa Quercus	Oak-eggar (larva)	May 9	C.A.S.—A.H.B.R.
„ Lanestris	SmallEggar(bred)	April 3	C.A.S.
Drepana Falcataria	(off oak)	June 9	H.M.H.

NOCTUÆ

Mamestra Brassicæ	Cabbage moth	May 29	H.G.M.
Grammesia Trilinea	(at light)	June 10	F.J.H.J.
Agrotis Exclamationis	(at light)	June 10	F.J.H.J.
Tæniocampa Gothica		April 8	G.E.M.
„ Stabilis	(bred from pupa)	March 12	H.M.H.; C.A.S.
	(caught)	April 9	G.E.M.
Phlogophora Meticulosa	Angle shades	March 25	Mr. Hawkins.
		May 4	G.E.M.
Plusia Gamma	silver Y	May 11	J.B.O.; J.B.F.
Gonoptera Libatrix	Herald	April 18	G.E.M.
Euclidia Mi	(seen)	June 9	F.J.H.J.

GEOMETRINA.

Rumia Cratægata	Brimstone	May 11	G.E.M.
Selenia Illunaria	Early Thorn	April 15	G.E.M.
Iodis Lactearia	Small Emerald	May 25	H.M.H.—J.H.C.
*Ephyra Porata (556)		June 5	H.M.H.—F.J.H.J.
„ Punctaria		June 6	H.M.H.
* „ Pendularia (561)		June 5	F.J.H.J.
* „ Omicronaria(559)		June 8	F.J.H.J.
Asthena candidata		May 24	F.J.H.J.—H.M.H.
* „ Sylvata (565)		June 2	H.M.H.
Cabera Pusaria		May 25	H.M.H.—J.H.C.
„ Exanthemata		May 25	H.M.H.
Corycia Punctata		May 20	J.B.F.
„ Taminata		May 22	B.J.G.
Acidalia Remutata		May 20	H.M.H.—J.H.C.
Halia Wavaria		May 3	G.E.M.
Strenia Clathrata	Latticed Heath	May 11	H.M.H.
Lozogramma Petraria		May 10	J.B.F.

Name		*Date.*	*Captor.*
Fidonia Atomaria	Heath-moth	June 9	H.M.H.
Minoa Euphorbiata		June 6	H.M.H.—F.J.H.J.
Abraxas Grossulariata	Currant moth (larva)	May 26	H.M.H.
Lomaspilis Marginata		May 12	J.B.F.
Hibernia Progemmaria		Feb. 18	W.M.
Laurentia Miaria		May 22	H.M.H.
Eupithecia Vulgata	(at light)	May 4	H.M.H.
Melanthia Ocellata	Purple bar	June 9	F.J.H.J.
Melanippe Hastata	Argent & Sable	June 5	H.M.H.—F.J.H.J.
„ Biriviata		May 11	A.C.H.
„ Montanata		May 26	J.H.C.
„ Fluctuata		April 28	R.A.I.
Camptogramma Bilineata	Yellow Shell	June 10	F.J.H.J.
Cidaria Corylata		June 6	F.J.H.J.
*Anaitis Plagiata (765)		June 1	H.M.H.—H.S.G.R.

PYRALIDINA.

Herminia Barbalis		June 7 West Woods	H.M.H.—F.J.H.J.
„ Nemoralis		June 9 West Woods	H.M.H.
Pyrausta Purpuralis		May 11	H.M.H.—J.H.C.
„ Ostrinalis		May 1	H.M.H. — A. H. B. R.
Botys Pandalis		June 7	F.J.H.J.—H.M.H.
„ Fuscalis		June 5	F.J.H.J.
Pionea Forficalis		June 12	F.J.H.J.
Scopula Olivalis		May 30	H.M.H. — H.S.G.R.

Besides the above we may notice

Humble bee	Feb. 26	S.A.R.—J.B.O.
Wasp	Feb. 20	E.G.B.
Common bee	Quite abundant in the warm days in February.	
Hornet	June 7 in Manton Copse	F.J.H.J.
Cockchaffer	April 9	H.R.A.

NOTES, &c., ON INDIVIDUAL SPECIMENS.

The sudden change begun on April 8th, which hurried us straight from snow and hail to bright sunshine, attracting out a great number of hybernating insects, which had not made any appearance since one or two bright days in the beginning of February. The wet weather, however, that set in at the beginning of May, put an end to our Entomological researches, and not till the end of that month did insects begin to appear in any abundance.

The first thing we may notice this year is the extraordinary dearth of "whites," also the lateness of the "Orange tips," which, in abundance, seem to have taken their places.

A new "blue" has been added to our list of butterflies—*Argiolus*—the "Holly" blue. It was first discovered in Rabley Copse in some abundance, but since then single specimens have been taken near the Butts, by J. B. Fuller in the Forest, on the Common by E. S. Preston, and at Preshute by G. C. N. Bryan.

Of the *Sphingina*, the more important captures are the large Elephant, *(C. Elpenor)* at Clatford by C. A. Sladen, the Small Elephant *(C. Porcellus)* near the Butts, by Mr. J. Velvin, and the Bee-hawk *(S. Fuciformis)* also near the Butts, by C. A. Sladen.

Of the *Bombycina* the only one to notice is the "Ruby Tiger" taken flying along the Bath road.

Geometrina.—Two fine specimens of *M. Hastata*, the "Argent and Sable" moth were taken in the West Woods on the same day, the one by H. M. Hilton and the other by F. J. H. Jenkinson. This insect has not been taken since 1866, when two also were taken not far from the same spot.

Three new species of the genus Ephyra have been added to our list. We may remark that two years ago H. T. Stainton, Esq., remarked on the probability of our capturing *Pendularia* in the West Woods. Now it has been taken. The other two were *Omicronaria* taken near Manton Copse, and *Porata* in the West Woods.

Asthena Sylvata is also new to our list. Two specimens, at intervals, have been taken in Manton Copse.

It is extraordinary that *Anaitis Plagiata*, the "Treble bar," should not have turned up before, for it has been in excessive abundance, during June this year.

N.B.—We must correct a misprint in the *Geometrina*. What has always been noted as *Immutata* is really *Remutata*.

H. M. HILTON,
Head of the Section.

BOTANICAL NOTICES.

The accompanying List will be a sufficient proof of the activity of the Section during the past half year. Endeavours are being made to work out the duration of the different plants, and hence, though the list contains a goodly number of dates, the other notices are far more numerous. In fact, the dates already registered (each one involving at least an extra entry) amount to nearly 6000. This, added to the long list of new species and new localities shows an activity of the Botanical section never greater than during the past half year.

The mildness of the winter was such that a greater number of plants were not killed, and hence during the early months a large number of plants were in flower and continued so till replaced by those which had sprung up this year. A *W* has been prefixed to those plants which lasted all the winter.

As usual an Asterisk (*) indicates that the specimen observed was a cultivated one. "By" that the specimen, when observed, appeared to have been in flower a day or two.

Especial thanks are due to the Rev. J. Sowerby, F. E. Thompson, Esq., and F. Storr, Esq., without whose assistance it would have been impossible to have kept the register so complete as it is.

Names of those whose initials occur in the following list.

H.R.A	H. R. Armstrong.
W.A.	W. Atthill.
C.St.J.B.	C. St. J. Beauclerk.
R.H.B.	R. H. Bicknell.
J.G.B.	Rev. J. G. Bleeck.
H.E.B.	Rev. H. E. Booth.
M.B.	Miss Mabel Bradley.
T.B.	Mr. T. Burgess.
C.R.C.	C. R. Carr, Esq.,
D.A.C.	D. A. Coles.
E.H.D.	E. H. Davis.
G.W.D.L.	Rev. G. W. DeLisle.
H.S.D.	H. S. Dickinson.
S.B.D.	S. B. Dixon, Esq.
C.R.D.	C. R. Draper.
J.W.D.	J. W. Dudding.
W.D.F.	W. D. Fenning.
W.F.	W. Fergus, Esq., M.D.
S.C.V.F.	S. C. V. Filleul.

J.B.F.	J. B. Fuller.
E.A.F.	E. A. Furneaux.
J.H.G.	J. H. Garland.
J.B.G.	J. B. Gilmore, Esq.
R.M.B.G.	R. M. B. Glasse.
F.G.	F. Goodchild.
H.G.	H. Gordon.
B.J.G.	B. J. Guillemard.
E.G.	E. Gunner.
E.L.H.	E. L. Hesketh.
P.L.H.	P. L. Hesketh.
A.C.H.	A. C. Hilton.
H.M.H.	H. M. Hilton.
J.W.H.	J. W. Hockin.
A.D.B.H.	A. DeB. Hovell.
F.J.H.J.	F. J. H. Jenkinson.
H.T.K.	H. T. King.
J.F.L.	J. F. Laver.
J.A.L.	J. A. Lefroy.
D.E.L.	D. E. Leighton.
H.M.	H. Macdougall.
G.E.M.	G. E. Manisty.
G.C.M.	G. C. Mansel.
W.M.	W. Mansell, Esq.
G.E.Me	G. E. Mew.
J.B.O.	J. B. Oakeley.
W.S.O.	W.S.Owen
E.P.	E. Peters.
E.S.P.	E. S. Preston.
T.A.P.	Rev. T. A. Preston.
C.T.R.	C. T. Richardson.
H.S.S.	H. S. Sankey.
F.H.S.	F. H. Shelley.
H.E.S.	H. E. Sieveking.
C.A.S.	C. A. Sladen.
T.N.H.S.	T. N. H. Smith.
C.S.	Rev. C. Soames.
J.S.	Rev. J. Sowerby.
H.C.S.	H. C. Spry.
F.S.	F. Storr, Esq.
J.S.T.	Rev. J. S. Thomas.

F.E.T.	F. E. Thompson, Esq.
C.E.T.	Rev. C. E. Thorpe.
A.J.T.	A. J. Tisdall.
R.L.T.	R. L. Tisdall.
E.J.T.	E. J. Turner, Esq.
J.V.	Mr. J. Velvin.
H.J.V.	H. J. Verrall.
C.R.W.	C. R. Waldron.
D.W.	D. Walker.
O.F.W.	O. F. Williams.
A.P.W.	A. P. Wood.
H.J.S.W....	H. J. S. Wood.
O.E.W.	O. E. Woodhouse.
G.W.	G. Wootten.

Clematis
vitalba ..... not in bud, June 22
Thalictrum
flavum ...... June 13, J.S.
Anemone
nemorosa ... Feb. 27, F.E.T.
*apennina ... about Mar. 28
*sylvestris... May 10
*hepatica ... Jan. 6, J.G.B.
Adonis
autumnalis Mar. 9, T.A.P.
Myosurus
minimus ... May 1, J.S.
Ranunculus
trichophyllus full fl. May 10, F.S.
heterophyllus April 13, C.E.T.
peltatus ...... full April 24, J.S.
circinatus ... by May 27, T.A.P.
hederaceus ... full fl. May 1, J.S.
sceleratus ... (Devizes), Apr. 29, J.S. and F.E.T.
flammula ... June 10, J.S.
ficaria....... Jan. 30, H.E.B.
auricomus ... March 8, G.C.M.
acris .... April 18, J.S.
W repens...... Feb. 27, J.S.
bulbosus...... March 30, F.E.T.
arvensis ...... May 1, J.S.; Apr. 29, (Devizes), F.E.T.
parviflorus ... April 27, F.E.T.
Caltha
palustris ... March 5, H.E.S.
Trollius
*Europæus May 7
Eranthis
*hyemalis ... Jan. 11, T.B.
Helleborus
viridis ...... Feb. 24, H.S.S.
Aquilegia
vulgaris ... *April 28; May 12, H.J.V.
Aconitum
*napellus ... April 27
Nuphar
*luteum...... May 24, J.H.G.
Berberis
vulgaris...... May 9, J.S.
*fascicularis Feb. 7, H.E.B.
Papaver
Argemone ... May 15, H.J.V.
rhœas......... May 12, J.S.
Dubium...... May 25, T.A.P.

Lecoqii	May 27, T.A.P.
Meconopsis	
*cambrica	by May 25
Chelidonium	
majus	Ap. 27, T.A.P.; May 2, G.E.M.
Corydalis	
*solida	March 9
Fumaria	
W officinalis	Feb. 16, F.E.T.
*formosa	April 19
Nasturtium	
officinale	May 21, J.H.G.
palustre	May 7, J.S.
Barbarea	
vulgaris	April 20, T.A.P.
Arabis	
hirsuta	May 5, C.E.T.
Cardamine	
sylvatica	full April 29, T.A.P.
hirsuta	full Feb. 13, J.S.
pratensis	March 25, C.S.
Sisymbrium	
officinale	April 13, J.S.
thalianum	Feb. 26, J.S.
Alliaria	
officinalis	April 12, F.E.T.
Brassica	
oleracea	April 11, T.A.P.
campestris	April 18, J.S.
napus	April 21, D.A.C.
Rapa	April 14, G.W.D.L.
Lunaria	
*biennis	full April 25, J.S.
Sinapis	
W arvensis	Feb. 16, F.E.T.
W alba	full May 12, T.A.P.
nigra	(Devizes) Apr. 29, J.S.
Alyssum	
calycinum	by May 21, J.S.
Aubrietia	
*	by Feb. 13
Draba	
verna	Feb. 26, J.S.
Armoracia	
rusticana	April 29, T.A.P.
Lepidium	
campestre	bud April 15, F.E.T.
W Capsella	
bursa-pastoris	Feb. 13, F.E.T.
Isatis	
*tinctoria	by May 10
Raphanus	
Raphanistrum	by May 27, H.J.V.
Resedea	
lutea	May 27 (Highclere) F.G.; May 29, J.S.
Helianthemum	
vulgare	May 16, F.S.
Viola	
odorata	Jan. 17, J.V.
hirta	full Mar. 12, J.S.
Reichenbachiana	March 4, J.S.; Apr. 20, J.S.
Riviniana	Feb. 20; March 6, F.E.T.
canina	May 6, C.A.S.
tricolor	April 23, J.S.
(var)arvensis	April 8, F.J.H.J.
*cornuta	April 26
Polygala	
vulgaris	April 25, C.R.D.
Dianthus	
*cæsius	May 29
Silene	
inflata	May 27, C.E.W.; E.P.

Lychnis	
flos-cuculi ...	May 7, J.S.
vespertina ...	May 1, J.S.
W diurna ...	Feb. 21, J.B.O.; April 20, T.A.P.
Githago......	May 15, F.S.
Sagina	
procumbens	full, May 27, G.W.D.L.
Arenaria	
trinervis ...	April 20, F.E.T.
serpyllifolia	May 9, J.S.
leptoclados...	full May 23, F.E.T.
Stellaria	
W media......	All the year
Holostea ...	Feb. 27, F.E.T.; Mar. 25, J.S.
graminea ...	May 27 (Highclere), F. G.; June 2, (Oare) F.S.; June 10, F.E.T.
uliginosa ...	by May 27, T.A.P.
Cerastium......	
glomeratum	March 7, F.E.T.
W triviale ...	April 11, F.E.T.
*arvense ...	May 11
Mœnchia	
erecta.........	May 21 (over) J.S.
Malva	
moschata ...	bud June 10, J.S.
sylvestris ...	June 6, J.S.
rotundifolia..	May 1, T.A.P.
Tilia	
parvifolia ...	Young leaves, Mar. 25, J.W.D.; ditto April 12, W.M.
Acer	
campestre ...	Ap. 22, F.E.T.
Pseudo-platanus	April 29, (Devizes) F.E.T.; May 7, J.S.

Æsculus	
Hippocastanum	buds bursting, March 25, R.H.B.; leaf Ap.12; fl. Ap. 26, F.E.T.
Geranium	
Phæum	*May 10; May 15, J.S.
* sylvaticum	May 11.
pratense ...	May 30, J.S.
*sanguineum	June 2.
lancastriense	May 23.
dissectum ...	May 11, F.E.T.
columbinum	May 15, F.S.
rotundifolium	by May 10, T.A.P.
molle.........	Ap. 20, F.E.T.
lucidum......	Ap. 26, C.E.T.; May 6, A. de B.H.
Robertianum	Ap. 27, F.E.T.
* macrorhizon.........	Ap. 10
Erodium	
cicutarium	June 5, J.S.
Linum	
Catharticum	May 22, F.E.T.
Oxalis	
acetosella ...	Ap. 20, T.A.P.
Euonymus	
Europæus ...	bud Mar. 16, H.R.A.; May 13, E.J.T.
Staphylea	
* pinnata ...	April 25.
Rhamnus	
catharticus	bud May 27, O.F.W.; fl. June 13, F.S.
Ulex	
W Europæus	all the year.
Genista	
tinctoria ...	May 27, (Highclere) F.G.

Sarothamnus	
scoparius	March 23, J.S.
Medicago	
lupulina	April 19, F.E.T.
Trifolium	
pratense	Ap. 24, J.S.
*incarnatum	May 13, F.S.
repens	May 5, F.S.
procumbens	by May 27, T.A.P.
minus	May 6, F.E.T.
Lotus	
corniculatus	May 1, F.E.T.
major	bud June 16, T.A.P.
Anthyllis	
vulneraria	May 11, F.S.
Vicia	
cracca	bud June 16, J.S.
hirsuta	May 12, J.S.
tetrasperma	May 7, J.S.
sylvatica	bud June 10, T.A.P.
sepium	April 18, J.S.
sativa	May 7, J.S.
* faba	May 1, F.E.T.
Lathyrus	
pratensis	June 10, W.M.
macrorhizus	Ap. 8, J.S.; Ap. 29, E.G.
Ornithopus	
perpusillus	May 27, (Highclere) F.G.
Hippocrepis	
comosa	May 17, H.J.V.
Onobrychis	
sativa	bud April 23, J.S.; May 15, F.S.
Cytisus	
*Laburnum	Ap. 30, G.W.D.L.
Prunus	
spinosa	Feb. 20, F.E.T.; leaf March 7, C.R.D.
insititia	Feb. 18, (Pewsey) S.B.D.; Feb. 27, D.E.L.
domestica	Ap. 10, J.S.
Avium	Ap. 12, G.W.D.L.
*Padus	Ap. 27 (Devizes) J.S.
cerasus	Ap. 10, B.J.G. & F.G.
Spiræa	
ulmaria	June 13, J.S.
Sanguisorba	
officinalis	Ap. 20, F.E.T.
Poterium	
Sanguisorba	Ap. 27, J.S.
Alchemilla	
vulgaris	March 11, C.A.S.
arvensis	by March 12, J.S.
Sibbaldia	
*procumbens	full fl. May 10.
Potentilla	
anserina	May 12, T.A.P.
Tormentilla	May 5, F.S.
fragariastrum	Jan. 18, H.E.B.
Fragaria	
vesca	*Jan. 13, J.V.; Feb. 23, J.S.
Rubus	
Idæus	*May 11; May 22, F.E.T.
cæsius	May 18, J.S.
fruticosus	May 22, J.S.
Geum	
W urbanum	Feb. 7, J.S.
intermedium	May 15, J.S.
rivale	*Ap. 11; Ap, 26, F.E.T.
Rosa	
canina	bud May 6, C.E.T.; fl. May 23, G.E.Me.
arvensis	June 13, F.S.; June 20, A.P.W. and E.A.F.

Cratægus	
oxyacantha	leaf March 7, H.T.K. March 25, W.F.; fl. Ap. 29 (Devizes) J.S.; Ap. 30 S.C.V.F.
Pyrus	
malus	April 26, F.E.T.
*aucuparia	May 8, F.S.
Aria	by May 15, F.S.
*Japonica	Feb. 9, H.E.B.
Amygdalus	
*communis	Feb. 10, H.E.B.
* Apricot	Feb. 6, H.E.B.
* Apple	Ap. 27, T.B.
* Peach	Feb. 25, T.B.
* Damson	Feb. 5, T.B.
* Plum	March 19, J.W.D.
* Pear	March 19, J.W.D.
* Medlar	May 23, J.H.G.
Epilobium	
montanum	June 8, T.A.P.
Montia	
fontana	May 15, J.S.
Bryonia	
dioica	May 22, F.E.T.
Spergula	
arvensis	May 1, J.S.
Scleranthus	
annuus	May 15, H.J.V.
Sedum	
*Rhodiola	by May 10
album	bud June 16, F.S.
acre	June 11, F.S.; June 20, E.S.P.& R.L.T.
Ribes	
grossularia	March 9, T.A.P.
rubrum	Ap. 8, F.E.T.; *Ap. 5, T.B.
nigrum	over May 27, T.A.P.
* sanguineum	Jan. 28, J.V.; Feb. 24, T.A.P.
*aureum	April 13, T.A.P.
Saxifraga	
*umbrosa	Ap. 30, M.B.
cæspitosa	May 15.
*Crassifolia	Feb. 13.
*Kamschatica	June 8.
tridactylites	Feb. 28, J.S.
granulata	April 20, J.S.
Philadelphus	
*Coronarius	May 16, J.W.D.
Sanicula	
Europæa	Ap.29, F.J.H.J.; (full) May 9, F.S.
Helosciadium	
inundatum	June 10, F.E.T.
Ægopodium	
podagraria	bud May 12, F. S.; May 27, T.A.P.
Bunium	
flexuosum	May 1, J.S.
Pimpinella	
saxifraga	April 6, F.E.T.
Œnanthe	
crocata	just out May 30, J.S.
Æthusa	
cynapium	bud April 21, F.E.T.
Haloscias	
*scoticum	by June 16.
Silaus	
pratensis	June 6, J.S.
Meum	
*Athamanticum	May 13.
Angelica	
sylvestris	June 10, J.S.
Pastinaca	
W sativa	Feb. 16, F.E.T; May 12, F.E.T.

Heracleum	
sphondylium	April 20, F.E.T.
Daucus	
carota	May 12, F.E.T.
Torilis	
nodosa	full bud May 29, J.S.
Scandix	
W pecten	all the year.
Anthriscus	
sylvestris	Feb. 14, J.B.F.; Feb. 24, F.S.; Ap. 3, J.S.
Chærophyllum	
temulum	May 22 (Hungerford) F. S.; May 27, A.P.H.
Conium	
maculatum	June 9 (Calne), F.S.
Adoxa	
moschatellina	Feb. 20, E. im T.; March 5, J.S.
Cornus	
sanguinea	May 31, J.S.
*mascula	Feb. 13.
Sambucus	
nigra	May 4, J.S.; May 12, J.S.; May 20.
Viburnum	
latana	Ap. 19, F.E.T.
opulus	*May 14, J.S.; May 27, J.F.L.; (fertile) June7,F.E.T.
*laurustinus	Feb. 13, T.B.
Lonicera	
*caprifolium	Ap. 29 (Devizes), J.S.; May 1, J.S.
Periclymenum	June 2.
Symphoricarpos	
*racemosus	by June 19.

Sherardia	
arvensis	Ap. 20, F.E.T.
Asperula	
cynanchica	not observed.
odorata	*Ap.19; Ap.26,F.E.T.
Galium	
cruciatum	April 19, J.S.
Aparine	April 30, J.S.
Mollugo	June 2, J.S.; June 13, J.S.
verum	coloured bud June 20, J.H.G.
saxatile	May 27 (Highclere), F.G.; June 10, F.S.
uliginosum	June 2 (Oare), F.S.
(var) Witheringii	June 19, F.E.T.
Centranthus	
*ruber	by June 6.
Valeriana	
officinalis	June 9 (Calne), F.S.; bud June 10.
dioica	April 30, J.S.
Valerianella	
olitoria	April 22, T.A.P.
Dipsacus	
sylvestris	bud June 15, J.B.G.
Knautia	
arvensis	May 22, J.S.; May 27, G.W., T.N.H.S.
Petasites	
vulgaris	Feb. 25, F.S.; March 3, H.M.
Tussilago	
Farfara	Feb. 14, J.B.F.
Bellis	
W perennis	all the year.
Achillea	
* tomentosa	May 18.
W Millefolium	still out Feb. 13, J.S.; new fl. June 4, J.S.

Anthemis	
arvensis	nearly out May 18, J.S.; May 28, F.S. May 27, O.F.W.
nobilis	June 10, T.A.P.
Matricaria	
Parthenium	About June 16
W inodora	Feb. 21, J.S.
Chrysanthemum	
Leucanthemum	bud Ap. 24, J.S.; May 22, J.S.
segetum	May 22 (Hungerford) F.S.; by May 27 (Pewsey), H.J.V.
Doronicum	
* Pardalianches	Ap. 22.
Senecio	
W vulgaris	all the year.
Jacobæa	May 22, J.S.
aquaticus	bud May 27, J.F.L.; not in fl. June 16.
Serratula	
tinctoria	bud June 10, T.A.P.
Centaurea	
nigra	June 10, J.S.
cyanus	May 27, (Highclere), F.G.
scabiosa	June 9, (Calne) F.S.: June 10, T.A.P.
*montana	May 13, F.S.
Carduus	
nutans	April 27, F.E.T.
crispus	May 2, H.G.; May 13, F.S.
lanceolatus	bud, June 20.
arvensis	not in flower, June 20.
palustris	bud May 20, H.J.V.; May 27, G.W.D.L.
acaulis	not in fl. June 20.

Silybum	
marianum	bud May 23.
Lapsana	
communis	June 4, J.S.
Hypochœris	
radicata	May 7, J.S.
Apargia	
hispida	May 17, H.J.V.
Tragopogon	
minor	May 11, J.S.
Leontodon	
W taraxacum	all the year.
Sonchus	
W oleraceus	March 9, T.A.P.; May 27, H.C.S.
W asper	March 7, J.S.: April 13, J.S.
Crepis	
W virens	still out Feb. 21; fresh fl. May 5, F.E.T. and J.S.
Hieracium	
pilosella	May 6, F.E.T.
*aurantiacum	May 17
Campanula	
glomerata	*May 10; May 23, F.S.
Specularia	
hybrida	by May 22, F.E.T.
Ilex	
aquifolium	nearly out Ap. 2, F.E.T.; Ap. 29, (Devizes), J. S.; fl. May 12, F.E.T.
Ligustrum	
vulgare	May 27, (Highclere), F. G.; June 9, (Calne), F.S.; bud June 10, (Marlborough.
Fraxinus	
excelsior	March 5, J.S.

Syringa	
*vulgaris	Ap. 23, F.E.T.
*Persica	Ap. 23, T.A.P.
Vinca	
minor	Feb. 3, H.E.B.
major	Mar. 17, J.S.
Gentiana	
amarella	June 8, (a single specimen).
Menyanthes	
trifoliata	*Ap. 19, J.H.G.; by Ap. 22, J.S.
Convolvulus	
arvensis	June 12, J.S.
Cynoglossum	
officinale	cold buds May 16, G.W.; May 19, C.E.T.
Borago	
*officinalis	about Ap. 20
Lycopsis	
arvensis	May 1, J.S.
Symphytum	
officinale	Ap. 15, C.E.T.
Pulmonaria	
officinalis	*Feb. 13, T.A.P.
Lithospermum	
officinale	May 18, J.S.
arvense	Ap. 22, F.S.
Myosotis	
palustris	May 27, J.S.
arvensis	Ap. 26, J.S.
collina	Ap. 20, F.E.T.
versicolor	May 1, J.S.
Solanum	
Dulcamara	June 5, J.S.
Atropa	
* Belladonna	May 23
Hyoscyamus	
niger	by June 17, F.S.
Lycium	
*barbarum	May 12, F.E.T.
Orobanche	
minor	June 5, J.S.
Lathræa	
squamaria	Ap. 11, B.J.G. & F.G.
Verbascum	
Thapsus	bud June 20, H.S.D.
nigrum	bud June 13, J.S.
Antirrhinum	
*majus	May 23
Linaria	
cymbalaria	Ap. 17, F.E.T.
Scrophularia	
nodosa	June 2, J.S.
aquatica	bud June 16
Melampyrum	
pratense	May 27, T.A.P.
Pedicularis	
sylvatica	Ap. 30, H.E.B.
palustris	June 10, J.S.
Rhinanthus	
Crista-galli	May 11, W.D.F., and A.C.H.
Euphrasia	
officinalis	May 27, C.E.T.
odontites	June 13, F.S.
Veronica	
Anagallis	May 27, T.A.P.
Beccabunga	May 19, J.S.
Chamædrys	Ap. 12, C.E.T.
officinalis	June 10, J.S.
serpyllifolia	Ap. 30, J.S.
W arvensis	all the year
W agrestis	ditto
W polita	ditto
W Buxbaumii	ditto
hederifolia	Feb. 16, F.E.T.
Thymus	
serpyllum	June 5, J.S.

Prunella	
vulgaris	bud June 16.
Nepeta	
Glechoma	March 3, R.A.
Lamium	
W amplexicaule	all the year
W purpureum	all the year
W album	all the year
Galeobdolon	April 23, F.E.T.; G E.Me.
Stachys	
Betonica	bud June 16, T.A.P.
sylvatica	June 10, J.S.
Ballota	
fœtida	bud May 1: bud June 10.
Ajuga	
reptans	bud March 20, P.L.H. April 26, J.S.; white var. May 16 H.T.K.; May 27, T.N.H.S.
Primula	
vulgaris	Jan. 17, J.V. coloured var. Mch 20, O.E.W.
caulescens	(full) April 11, F.H.S.
veris	Feb. 27, D.E.L.; March 20, E.L.H.
Lysimachia	
nemorum	May 11, J.S.
Anagallis	
arvensis	by May 1, J.S.
Plantago	
laceolata	Ap. 11, J.S.
media	May 7, J.S.
major	May 27, J.S.
Chenopodium	
Bonus-Henricus	May 9, J.S.

Rumex	
conglomeratus	June 10, T.A.P.
obtusifolius	June 8, T.A.P.
crispus	May 12, C.E.T.
acetosa	Ap. 27, J.S.
acetosella	May 1, J.S.
Polygonum	
Bistorta	*full bud May 10, C.St.J.B.
amphibium	bud May 27, J.S.
Daphne	
*mezereum	Jan 2, H.E.B.
Laureola	Feb. 16, J.S.
Buxus	
sempervirens	Feb. 16, J.S.
Euphorbia......	
W Helioscopia	all the year
amygdaloides	March 4, J.S.
W Peplus	all the year
exigua	May 17, J.S.
Mercurialis	
perennis	male Feb. 13, H.M.H. fertile Feb. 15, T.A.P.
Callitriche	
verna	May 7, J.S.
Urtica	
urens	Feb. 13, F.E.T.
dioica	May 20, T.A.P.
Ulmus	
suberosa	March 4, J.S.
montana	Feb. 5, J.S.
Salix	
caprea	Feb. 16.
Populus	
nigra	(full) March 7, J.S.
Betula	
glutinosa	Ap. 24, F.E.T.

Fagus	
sylvatica	buds bursting Mar. 22, J.A.L.; one tree green, Ap. 14, T.B.; fl. Ap. 24, J.S.
Castanea	
vulgaris	bud May 27, E.P.; bud June 5, J.S.
Quercus	
Robur	leaf Ap. 20, C.A.S.: fl. Ap. 20, J.S.
Corylus	
avellana	fertile fl. Jan. 17, J.V.; in fl. Ap. 20.
Juglans	
regia	May 13, T.A.P.
Carpinus	
Betulus	March 16, T.A.P.
Taxus	
baccata	Feb. 13, J.S.
Juniperus	
communis	Ap. 20, T A.P.; May 6, F.E.T.
Pinus	
sylvestris	May 2, C.R.C.
Larix	
Europæa	Feb. 18, G.W.D.L.
Paris	
quadrifolia	by May 1, F.G.
Tamus	
communis	May 27, H.J.V.; O.F.W.; T.N.H.S.
Orchis	
morio	Ap. 20, F.E.T. May 1
mascula	Ap. 11, J.S.
ustulata	May 17, J.S.
maculata	May 22 (Hungerford) F.S.; May 27, G.W.D.L.
latifolia	June 10, J.S.
incarnata	May 9, J.S.
pyramidalis	June 10, J.S.
Gymnadenia	
conopsea	bud May 27, J.S.; June 5, F.E.T.
Habenaria	
viridis	about May 22, C.S.
chlorantha	May 23, F.E.T.
Listera	
ovata	May 5, F.S.
Neottia	
nidus-avis	May 27 (Highclere), F.G.; not observed about Marl.
Epipactis	
latifolia	bud June 20.
Cephalanthera	
grandiflora	June 10 (Oare), F.S.
Sisyrinchium	
* anceps	May 29.
Iris	
Pseudacorus	full bud Ap. 18, J.S; fl. May 15, H.R.A.
fœtidissimus	bud June 22.
Crocus	
*vernus	June 14, J.V.
Narcissus	
pseudo-narcissus	*Feb. 10, J.V.; full fl. Feb. 20, E H.D.
Leucojum	
*Æstivum	April 26.
Galanthus	
nivalis	Jan. 11, T.B.; Jan. 12, J.V.
Convallaria	
*majalis	April 28, M.B.
Polygonatum	
multiflorum	April 29 (Devizes), F.E.T.; (Bedwyn) F.J.H.J.; May 1 (Ramsbury) F.G.; May 12, F.E.T.

Ruscus	
aculeatus ...	bud March 16, T.A.P; fl. by Ap.25, F.S.
Tulipa	
*sylvestris...	April 6.
Van Thol Tulip......	March 5, T.B.
Fritillaria	
*meleagris	About April 10.
*Imperialis	March 9.
Ornithogalum	
umbellatum	*by May 10; May 27, C.E.T.
Scilla	
*bifolia	by Feb. 13.
*sibirica ...	by Feb. 13.
*amœna......	full fl. Feb. 13.
Allium	
vineale	bud June 22.
ursinum......	*May 11; full fl. May 22, F.E.T.
Endymion	
nutans	bud Mar. 25, H.R.A.; April 9, H.J.S.W. and C.R.D.
(white var.)	April 29, E.G.
Garden hyacinth	Feb. 13
Muscari	
*racemosum	March 9.
Erythronium	
*Dens-canis	March 9, J.S.T.
Anthericum	
*liliastrum	May 14.
Juncus	
effusus	bud June 16.
glaucus	bud June 2.
acutiflorus...	April — J.S.
bufonius ...	bud June 10, W. M.
Luzula	
pilosa ...	March 25, J.S.
campestris	April 2, F.E.T.
Alisma	
plantago ...	June19(Bedwyn)F.S.
Arum	
maculatum	Apr. 18, E.P. and A.P.W.
Orontium	
*aquaticum	April 19, J.H.G.
Potamogeton	
crispus	May 21, J.S.
Eleocharis	
palustris ...	Ap.29(Devizes),J.S.; May 27, T.A.P.
Scirpus	
lacustris ..	May 20, W.S.O.
Carex	
pulicaris ...	seed June 16
divulsa	May 5, F.E.T.
vulpina	Ap. 22, J.S.
paniculata ..	by May 20, J.S.
pendula......	April 29, (Devizes), F.E.T.
præcox	April 20, J.S.
pilulifera ...	April 29, T.A.P.
glauca	April 20, T.A.P.
sylvatica ...	April 29, T.A.P.
hirta	May 27, J.F.L.
paludosa ...	April 18 J.S.
riparia	April 8, J.S.
Phalaris	
arundinacea	June 10, T.A.P.
Anthoxanthum	
odoratum ...	April 20, T.A.P.
Phleum	
pratense ...	June 10, T.A.P.
Alopecurus	
pratensis ...	March 25, F.E.T.
geniculatus	(full) June 8, T.A.P.
agrestis	Ap. 20, T.A.P.
Milium	
effusum	May 1, T.A.P.

Holcus	
lanatus	May 15, H.J.V.
mollis.........	June 10, T.A.P.
Aira	
cæspitosa ...	June 10, T.A.P.
flexuosa... ..	May 27, T.A.P.
caryophyllea	May 21, J.S.
Trisetum	
flavescens ...	June 8, T.A.P.
Avena	
pratensis ...	May 20, J.S.
pubescens...	May 21, J.S.
Arrhenatherum	
avenaceum	May 27, T.A.P.
Kœleria	
cristata	May 25, J.S.
Melica	
uniflora	Ap 30, J.S.
Poa	
W annua ...	all the year
trivialis	May 12, T.A.P.
pratensis ...	April 19, T.A.P.
Glyceria	
fluitans	May 15, H.J.V.
plicata	June 10, J.S.
aquatica ...	June 19, F.E.T.
Briza	
media.........	May 22, J.S.
Catabrosa	
aquatica......	June 9 (Calne), F.S.
Cynosurus	
cristatus ...	May 27, T.N.H.S.
Dactylis	
glomerata ...	April 29, T.A.P.
Festuca	
sciuroides ...	May 27, T.A.P.
ovina	May 21, J.S.
rubra	May 7, J.S.
arundinacea	June 8, T.A.P.
Bromus	
erectus	Ap. 27, J.S.
asper	May 21, T.A.P.
sterilis	May 7, J.S.
Serrafalcus	
racemosus ...	May 1, J.S.
mollis.........	April 29, T.A.P.
Lolium	
perenne	May 1, T.A.P.
Rye	May 1, J.S.
Barley ...	June 8, T.A.P.
Wheat ...	June 14, G.W.D.L.
Equisetum	
arvense	fertile Ap. 17, F.E.T.; barren April 27, C.R.W.
limosum ...	April 15, C.E.T.
palustre......	April 6, J.S.
Pteris	
aquilina......	9 inches high Ap. 25, C.A.S.; 1 ft. May 9, E.A.F.; 3 feet May 16, E.A.F. and C R.D.
Botrychium	
Lunaria	May 5, C.A.S.
Ophioglossum	
vulgatum ...	May 27, T.A.P.
Morchella	
esculenta ...	April 11, R.M.B.G.
semilibera...	April 25, C.T.R.
Spumaria	
mucilago	May 21, A.J.T.

NEW SPECIES.

Ranunculus trichophyllus	Near Pewsey, F.S.; Bedwyn, J.S.
Ranunculus Sceleratus	Devizes, J.S. & F.E.T.
Sinapis nigra	Devizes, J.S. & F.E.T.
Alyssum calycinum	Field near the Grand Stand on Marlborough Common, J.S.
Arenaria leptoclados	Marlborough, F.E.T.
Mœnchia erecta	Near Rockley Farm, J.S.
Lotus major	Axford, T.A.P.
[Ornithopus perpusillus	Highclere, F.G.]
Galium uliginosum	Oare, F.S.; Bedwyn, J.S.
Galium uliginosum— (var. Witheringii)	Axford, J.S.
Silaus pratensis	Fyfield, J.S.; Polton, F.S.
Specularia hybrida	Martinsell, F.E.T.: Bedwyn, J.S.
Typha latifolia	Axford, T.A.P.; near Savernake, J.S.
Juncus acutiflorus	Axford, T.A.P.
Carex paniculata	Axford, J.S.
Aira flexuosa	Martinsell, T.A.P.
Catabrosa Aquatica	Calne, F.S.

NEW LOCALITIES.

Ranunculus parviflorus	Devizes, J.S. & F.E.T.
Papaver argemone	Pewsey, J.S.
[Corydalis solida	Mildenhall, H.J.V.]
Reseda lutea	Mildenhall, J.S.; Highclere, F.G.
Viola canina	Savernake Forest, C.A.S.
Stellaria uliginosa	Marlborough water meadows, T.A.P.
Geranium columbinum	Rabley, F.S.; Mildenhall, W.M.
Geranium lucidum	Fyfield, C.E.T.
Erodium cicutarium	Near Savernake, J.S.
Pyrus Aria	Mildenhall, F.S.
Montia fontana	Martinsell, J.S.
Scleranthus annuus	Martinsell, J.S.; Mildenhall, T.A.P.
Dipsacus sylvestris	Near Axford, J.B.G.
Anthemis arvensis	Mildenhall, F.S.; Savernake, T.A.P.
Chrysanthemum segetum	Pewsey, T.A.P.
Lycopsis arvensis	Pewsey, J.S.
Lithospermum officinale	Rockley, T.A.P.
Polygonum Bistorta	Bedwyn, T.A.P.; Mildenhall, J.B.G.
Allium vineale (?)	Mildenhall, T.A.P.

Allium ursinum	Mildenhall, C.S.
Ornithogalum umbellatum	Axford, C.E.T.; Martinsell, T.A.P.
Cephalanthera grandiflora	Oare, F.S.
Juncus bufonius	Polton, W.M.
Carex pendula	Devizes, J.S. and F.E.T.; Pewsey, F.S.
Aria caryophyllea	Rockley, J.S.
Ceterach officinarum... ...	Devizes, J.S. and F.E.T.
Ophioglossum vulgatum ...	Canal near Savernake, T.A.P.

ORNITHOLOGY.

The following are the names of those whose initials occur in the following list:—

R.A.	R. Atkinson
D.J.B.	D. J. Blyth
L.C.	L. Calley
G.T.P.C.	G. T. P. Cambridge
J.H.R.C.	J. H. R. Clark
D.C.	D. Coles
C.E.D.	C. E. Down
H.C.E.	H. C. Eyres
A.B.F.	A. B. Fenton
S.E.V.F....	S. E. V. Filleul
J.B.F.	J. B. Fuller
J.T.F.	J. T. Fullerton
W.G.	W. Gay
T.G.G.	T. G. Gibbons
R.M.B.G.	R. M. B. Glasse
B.J.G.	B. J. Guillemard
E.L.H.	E. L. Hesketh
H.M.H.	H. M. Hilton
H.M.	H. Manders
J.C.M.	J. C. Mansell
J.B.O.	J. B. Oakeley

T.C.O.	T. C. Owen
R.P.	R. Phayre
S.A.R.	S. A. Rogers
F.H.S.	F. H. Shelley
C.A.S.	C. A. Sladen
S.S.	S. Smallpiece
W.J.S.	W. J. Smythies
H.C.S.	H. C. Spry
H.P.St.J.	H. P. St. John
T.T.	T. Tilleard
G.M.T.	G. M. Tuke
F.F.W.	F. F. White

Falco tinnunculus	**Kestrel Hawk**	**egg May 11th, T. T.**
Accipiter nisus	**Sparrow Hawk**	**egg April 29th, J. B. F.; E. L. H.**
Otus vulgaris	**Long-eared Owl**	**egg March 20th, J. B. O.; S. A. R.**
Strix flammea	**Barn Owl**	**egg May 8th, R. M. B. G.; R.A.**
Syrnium stridula	**Tawny Owl**	**young birds May 10th, T. W. Harvey**
Lanius collurio	**Butcher bird**	**egg May 27th.**
Muscicapa griseola	**Spotted Flycatcher**	**egg May 27th, J. B. F.; E. L. H.**
Turdus viscivorus	**Missel Thrush**	**egg March 14th, F. H. S.**
Turdus musicus	**Song Thrush**	**egg March 26th, S. A. R.; D.J. B.**
Turdus merula	**Blackbird**	**egg April 7th, J. H.R. C.; J.B.O.; young birds April 6th, T. T.**
Accentor modularis	**Hedge Sparrow**	**egg April 16th, A. B. F.; J. B. O.**
Erythaca rubecula	**Redbreast**	**egg April 10th, T. G. G.**
Phoenicura ruticilla	**Redstart**	**egg April 29th, G. T. P. C.**
Saxicola rubicola	**Stone-chat**	**egg April 25th, S. A. R.; F. F. W.**
Saxicola œnanthe	**Wheat-ear**	**seen April 8th, J.B.O. H.M.H.; egg May 9th, B. J. G.**
Saxicola rubetra	**Whin-chat**	**seen April 24th, T. T.**
Salicaria phragmitis	**Sedge Warbler**	**egg May 23rd, G. T.P. G.; S.E.V.F.**
Sylvia arundinacea	**Reed Warbler**	**egg May 27th, G. T.P.C.; S.E.V.F.**
Philomela luscinia	**Nightingale**	**egg May 30th, Mr. Armstrong.**
Sylvia atricapilla	**Black-cap**	**egg May 8th, H. C. S.; R. P.**
Sylvia hortensis	**Garden Warbler**	**egg May 15th, J. C. M.**
Sylvia cinerea	**Whitethroat**	**egg May 16th, T. T.**
Sylvia curruca	**Lesser Whitethroat**	**egg May 14th, J. B. F.; B. J. G.**
Sylvia sibillatrix	**Wood Warbler**	**egg May 21st, S. E. V. F.**
Sylvia trochilus	**Willow Warbler**	**seen April 11th, T.T.; egg May 12th, H. C. E.**

Sylvia rufa	Chiff-chaff	egg May 10th, J. B. O.
Regulus auricapillus	Gold-crest	egg May 12th, E. H. Currey.
Parus major	Greater Tit	egg April 26th, G. T. P. C.
Parus cæruleus	Blue Tit	egg April 24th, C. A. S.
Parus ater	Cole Tit	egg May 1st, R. A.; S. E. V. F.
Parus caudatus	Long-tailed Tit	egg April 20th, H. C. S.; R. P.
Motacilla Yarrellii	Pied Wagtail	egg April 24th, T. T.; H. M. H.
Motacilla flava	Yellow Wagtail	seen April 24th, S. A. R.
Anthus arboreus	Tree Pipit	egg May 22nd, J. B. F.; J. B. O.
Anthus pratensis	Meadow Pipit	egg May 9th, C. E. D.
Alauda arvensis	Sky Lark	egg April 19th, T. T.
Alauda arborea	Wood Lark	egg May 21st, S. E. V. F.
Emberiza schœniclus	Black headed Bunting	egg May 9th, J. C. M.
Emberiza citrinella	Yellow Bunting	egg April 24th, C. E. D.; D. C.
Fringilla cœlebs	Chaffinch	egg April 24th, S. A. R.; S. S.
Fringilla carduelis	Goldfinch	egg May 10th, T.C.M.; E.Le.S.Dobreé.
Fringilla cannabina	Linnet	egg April 25th, T. C.O.; H.P.St. J.
Coccothraustes chloris	Greenfinch	egg April 19th, T. T.
Passer domesticus	House Sparrow	egg April 24th, D. C.; C. E. D.
Pyrrhula vulgaris	Bullfinch	egg May 13th, T. T.
Sturnus vulgaris	Starling	egg April 19th, T. T.
Corvus frugilegus	Rook	egg March 12th, W. G.
Corvus monedula	Jackdaw	egg April 21st, T. T.; H. M. H.
Pica caudata	Magpie	egg April 22nd, T. T.; H. M. H.
Garrulus glandarius	Jay	egg April 20th, T. T.; J. B. O.
Picus viridis	Green Woopecker	egg May 10th R. M. B. G.; R. A.
Picus major	Great Spotted Woodpecker	Young birds taken in the forest.
Certhia familiaris	Tree creeper	egg May 1st, H. C. E.
Troglodytes vulgaris	Wren	egg May 4th, J. T. F.
Sitta europæa	Nuthatch	egg May 11th, T. C.O. and G.T.P.C.
Cuculus canorus	Cuckoo	seen April 14th, R.M.B.G. egg May 13th, C. P. Nash.
Hirundo rustica	Swallow	seen April 8th, J.B.O.; egg May 29th J. B. O.; J. B. F.
Hirundo urbica	Martin	seen April 11th, J. B. F.; E. L. H.
Hirundo riparia	Sand Martin	seen April 8th, J. B. O.; egg May 27th J. C. M.; R. S. Creaton.
Cypselus apus	Swift	seen April 24th, S.A.R.; egg June 15th, J. B. F.; E. L. H.

Columba palumbus	Ring Dove	egg April 12th, C. A. S.
Columba ænas	Stock Dove	egg April 20th, T. T.; J. B. O.
Columba turtur	Turtle Dove	egg May 29th, H. P. St.J.
Ædicnemus crepitans	Stone Curlew	egg April 22nd, J. B. O.
Vanellus cristatus	Lapwing	egg April 12th, J. B. O.
Totanus hypoleucus	Sandpiper	seen April 24th, J.B.O.
Gallinula chloropus	Moorhen	egg April 9th, H.M.; G.M.T.
Gallinula crex	Landrail	seen April 24th, F.F.W.
Podiceps minor	Dabchick	egg April 7th, L.C.; W.J.S.
Anas boschas	Wild Duck	egg April 23rd, H.C.S.; R.P.

ARCHÆOLOGY.

This section has shown more life this Half-year than usual, as the meetings have been held regularly every fortnight, and have been fairly well attended. Three table cases have been purchased to hold our curiosities, and these are full. The chief donations are a set of Esquimaux implements by Mr. Sawyer, of Marlborough, an old Bible, by Mr. Cane, some Feejee curiosities by Mr. Bambridge, and some Abyssinian by G.E. Manisty. The Coin collection has also greatly increased, the chief donors being the Rev. C. Soames, of Mildenhall, Rev. T. A. Preston, and E. A. Furneaux. H.R.H. Prince Leopold has also presented two gold coins, probably ancient British.

Table Case—No. I.

Flint Implements, presented by E. C. Scobell, Esq.

5 Angular Sling Stones
5 Rounded „
2 Flat „
5 Thumb flints
4 Elongated Thumb flints
A Knife and Scraper combined
Stone Axe-head
Axe-head and Hammer in one
4 Javelin Points
2 Leaf-shaped Arrow-heads

Barbed Arrow-head
2 Spear points
2 Knives
4 Knives of flint
5 Flint Saws
Common Scraper
Triangular „
Knife, saw, and scraper, combined
Arrow-tooth for agriculture
2 Flint Drills
Mealing Stone

Table Case—No. II.

Esquimaux Implements, presented by Mr. Sawyer.

2 Walrus Tusks
Model of Harpoon, with loose Head
Spear head for fishing
Drill bow and string, for procuring fire
Specimen of work in Reindeer hair
Ivory imitation of a silver fork
Ornament, at one end a bear asleep, at the other a bear with a seal in its mouth
3 Labrets or lip ornaments, worn through holes cut in the lip or cheek
Pipe and knife, overlaid with the solder from the preserved meat tins.

Table Case—No. III.

Bones of rat and sheep	from the house of a Pictish Chief in the Orkneys. Presented by J. B. Gilmore, Esq.
Burnt Bone	
Bone implements	
Antler of red deer	
Land-whelk	

Chinese 7d. bank-note and visiting card; presented by C. B. Everard, Esq.
Chinese Soldier's badge of merit, presented by Mr. Chivers.
Mummy Cloth, presented by Sergeant Adams.
Cement from Stonehenge, presented by Mr. Baverstock.
Bone spear-head, Flint hammer-head, Roman tear-bottle, and Cinerarium, presented by J. W. Parrington.
Medal of the Spanish Academy.
Key of the original Marlborough Castle, presented by Mr. Wooldridge.

COLLECTION OF COINS.

ENGLISH.

Two gold coins, probably ancient British; presented by H.R.H. Prince Leopold.

Saxon penny of Marlborough, presented by Rev. W. H. Bull.

William I	Penny	
William II	unrepresented	
Henry I		
Stephen		
Henry II	Penny (first coinage)	
Eleanor	Penny	
Richard I	Penny (Aquitaine)	
John	Half-penny	
Henry III	Penny	Rev. C. Soames
	Penny (Irish coinage)	
Edward I	Penny	F. Storr, Esq.
Edward II	Penny	
	Half-penny	
Edward III	Groat	Mr. C. Brampton
	Half-groat	
Richard II	Penny	
Henry IV	Penny	G. G. Monck
Henry V	unrepresented	
Henry VI	Penny (York coinage)	
Edward IV	unrepresented	
Edward V		
Henry VII		
Henry VIII		
Edward VI	Shilling	G. G. Monck
Mary	unrepresented	
Elizabeth	Two Shillings;	G. G. Monck, Rev. G. W. DeLisle
	Sixpence	E. C. Sewell
	Three-pence	
	Half-groat	
	Two penny pieces	
Mary, Queen of Scots	Plack	
James I	Half-groat	
	Penny	A. D. Nind
	Penny (Irish)	Rev. C. Soames

Charles I	Half-groat	
	Penny	Rev. C. Soames
Commonwealth	Shilling	
	Half-groat	
	Penny	
	Half-penny	
Charles II	Groat	Rev. C. Soames
	Three-pence	Mrs. C. W. Tayler
	Half-groat	Mrs. C. W. Tayler
James II	Half-crown (gun money)	Rev. C. Soames
	Threepence	Rev. C. Soames
William & Mary	Groat	Mr. C. Perkins.
	Half-groat	
William III	Shilling	
	Sixpence	Rev. G. D. Hodgson
Anne	Shilling	G. C. Brown
George I	unrepresented	
George II	Shilling	H. Freeman
	Sixpence	G. C. Brown
	Penny	Mrs. C. W. Tayler
George III	Sixpence	
	Half-groat	Mrs. C. W. Tayler
George IV	Lion shilling	
William IV	Half-crown	
Victoria	Florin (recalled)	
	Half-groat	C. Irwin
	Three half-pence	C. Irwin
	Penny	C. Irwin

ENGLISH COPPER.

Charles II	Scotch farthing	
	English farthing	
William & Mary	Half-penny	A. D. Nind
William III	Half-penny	Rev. C. Soames
George I	Farthing	
	Irish farthing	
	Irish half-penny	
George II	Penny	A. D. Nind
	Half-penny	
	Farthing	A. D. Nind
George III	Half-penny (1770)	Rev. G. D. Hodgson

George III	Cartwheel twopenny piece,	H. S. Dickinson
	„ penny piece	G A. W. Tate
	Penny 1806	G. A. W. Tate
	Half-pennny 1806	W. H. Churchill
	Farthing	W. H. Churchill
	Irish mite	
George IV	Half-penny	G. A. W. Tate
	Farthing	G. A. W. Tate
Victoria	Penny (1858)	
	Farthing	
	Mite	

ROMAN COINS:

Presented by Rev. C. Soames,

Gallienus
Claudius
Divo Claudio
Postumus
Victorinus
Tetricius
Carausius
Allectus
Probus
Licinius
Theodora and Helena
Constantinus
Soli Invicto
Prætorian Gate
Beata Tranquillitas
Const. Nob. Cæsar

Urbs Roma
Constantinopolis
Nob. Cæsar
Vot. X
Crispus
Nob. Cæs. Vot. V.
Gloria Exercitus
Constantius
Decentius
Magnensius
Constantius
Valens
Gloria Reipublicæ
Maximus
Constantius (from Egypt)

Heliogabalus		presented by	Rev. T. A. Preston.
Antonius Pius	silver denarius	„	J. C. Brown
Commodus	second bronze	„	J. C. Brown
Faustina	„	„	J. C. Brown
Vespasian	„	„	W. G. Fellowes

and others not yet arranged.

The collection also includes English Colonial coins, Tokens, as well as Foreign silver and copper coins.

W. D. FENNING.

DONATIONS TO THE MUSEUM.

Archæology.—

Mummy Cloth and part of Mummy presented by Sergt. Adams.
Bible and Prayer Book of 1683 „ Mr. W. Cane
Key of Marlborough Castle „ Mr. Wooldridge
Old Print of Place Vendome „ Mr. J. G. Crow
Collections of Coins presented by H.R.H. Prince Leopold, Rev. W. H. Bull, Rev. G. D. Hodgson, Rev. C. Soames, Mrs. C. W. Tayler, M. H. Smith, E. A. Furneaux, J. B. Oakeley, S. T. Owen, H. Smythies, Mr. Perkins, Rev. G. W. De Lisle.

Botany.—

Collection of Swiss Plants presented by A. H. B. Reynardson.
Collection of Mosses „ G. E. Manisty
British Plants „ R. B. C. Everard

Geology.—

Basket of eggs coated with lime from Knaresborough presented by H. C. Spry.
Fossil Ostrea, fern and vertebræ presented by Mr. Piper
Stigmaria from Forest of Dean „ Mrs. Jones
Fossils from Lias near Cardiff „ G. E. Manisty
Fossil bone from Battle „ F. H. Bowles

Entomology.—

Foreign insects presented by E. F. Vicars
Hornet's Nest, presented by J. B. Oakely

Mineralogy.—

Minerals from Botallack presented by W. H. Borlase
Malachite „ H. J. Verrall
Collections of Minerals presented by Mrs. Blandy, H. C. Spry, H. S. Sankey, C. G. H. Bryan, G. C. N. Mann, C. R. Waldron, E. H. Johns.

Ornithology.—

Spoonbill (shot in Norfolk) presented by E. F. im Thurn, Esq.
Pair of Crossbills, (shot in Monmouthshire), presented by J. B. Oakely,
Deformed Hen's egg, presented by G. E. Manisty.
10 Indian Birds „ F. W. Bourdillon.

Zoology—

Chilian Mummy presented by — Paddison, Esq.

Head of Shark, tooth of Elephant, saw of saw-fish, presented by Serg. Adams.

Head of Fallow deer, presented by Mr. Parker

Pearl Mussels from Conway ,, Dr. Thurnam.

Library—

Duke of Argyle's "Primeval Man"	presented by	W. W. Fowler, Esq.
Madden's Roman Coins	,,	W. D. Fenning
Geological Observer	,,	Mr. Neate.

Miscellaneous—

Polar Curiosities presented by Mr. Sawyer

Abyssinian bow and arms, presented by G. E. Manisty.

Three spears from Feejee Islands presented by Sergt. Adams.

Model of Canoe and ornament from Feejee Islands and 2 grass cloaks from New Zealand presented by W. S. Bambridge, Esq.

ACCOUNTS.

RECEIPTS.

	£	s.	d.
In hand	4	13	0
Subscriptions from Honorary Members	4	2	6
Ditto from Members ...	3	8	6
Arrears	0	16	0
Donations...	4	6	0
Sale of back Reports ...	0	17	6
„ Reports for Christmas, 1868	32	2	0
	£50	5	6

EXPENDITURE.

	£	s.	d.
Note-books for Museum Catalogues	0	16	0
Tracing of Preshute Map and Carriage of same	6	17	9
Conversazione	4	0	8
Anastatical Apparatus ...	0	2	6
Stationery	0	5	1
Candles, &c.	0	4	6
Field Day	1	9	6
Carriage of Spoonbill ...	0	2	0
Coins for Museum	1	5	0
Mr. Hillier's Bill	6	4	0
Books for Library	6	7	10
Printing Bill	18	0	0
Stuffing Pike	0	15	0
Balance in hand	3	15	8
	£50	5	6

(Signed),

G. E. MANISTY, } *Auditors.*
F. GILES,

ADDITIONS TO THE LIBRARY.

Madden's "Handbook to Roman Coins"	W. D. Fenning.
The Geological Observer	Mr. Neate.
The Duke of Argyle's "Primeval Man"	W. W. Fowler, Esq.
The "Student"	Rev. J. M. Fuller.
The "Popular Science Review"	Rev. J. M. Fuller.
The Ibis	Rev. T. A. Preston.
Entomologist	Ditto
Entomologist's Monthly Magazine	Ditto
The Zoologist	Purchased
Geological Magazine	Ditto
Yarrell's British Fishes, 2 vols.	Ditto
Lyell's Antiquity of Man	Ditto
Bell's British Reptiles	Ditto
Owen's British Fossil Mammals and Birds	Ditto
Pictorial Museum of Animated Nature, 2 vols	Ditto
Report of the Rugby Natural History Society	by the Society.

MARLBOROUGH:
C. PERKINS, PRINTER, HIGH-STREET.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1869.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE.
1870.

PREFACE.

The following pages will, it is hoped, prove that the working of the Society is not less energetic than formerly, but still this is not enough. In many points much work has been done—the Museum and Library have been more consulted, the Lectures have generally been well attended, and Papers have been written by Members—but this work has been confined to a *few*—and hence though it is satisfactory to be able to record no loss of energy in the Society as a whole, still there has not been much *increased* energy. This is certainly not the half-year most productive of results capable of being recorded, but it must be acknowledged that too much of what has been done has been done by a few, and that among the other Members of the Society a very great want of interest in its success has been apparent. The Committee have felt it necessary to *require* attendance at meetings, in consequence of some Members not being inclined to show even that amount of interest in the success of the Society. They have also to record the resignation of some old Members, and the expulsion of others from this want of interest, feeling that a few really working Members are more desirable than a large number who take no interest. In addition to this fault of non-attendance, it is to be regretted that Exhibitions have been very few, and the Committee therefore take this opportunity of urging upon the Members the real necessity of more *active* interest, and of hoping that next half-year will see our meetings more numerously attended and made more interesting by a proper number of Exhibitions.

At the same time the Society has come forward to the utmost of its ability to aid the study of Natural History in the School, for it is a very remarkable fact that many Members of the School do take interest in various branches of Natural History who have not joined the Society's ranks. The advantages to be enjoyed by the Field Days are freely thrown open to all, and the prizes offered for Essays are also subject to no restriction—in fact, it must be confessed that the privileges reserved for Members are so few that it is quite possible that those, who so freely make use of these opportunities afforded by the Society, find it more convenient to remain as they are and reap the advantages than join the Society's ranks, and so have a small subscription to pay and occasionally put themselves to a little inconvenience in attending the meetings. It ought, therefore, to be a source of gratification to Members to find that, few as they are in numbers, they are mainly instrumental in so freely throwing open these advantages to others.

Among the few remarks to be made in the proceedings of the Society during the past half-year, attention must be drawn to the following:—

A half-yearly prize has been instituted for an essay on any subject of Natural History; the particulars are given at the end of the Report. By making it a half-yearly prize it is rendered more accessible to all, and should its success be such as to warrant its being done, it is hoped that prizes for *each* branch of Natural History may ultimately be established.

The large increase in the number of our Honorary Members is very gratifying, as it shows a continued interest in the Society by those who worked for it when at School.

As the Collection of Subscriptions from so many is becoming a very serious matter, it has been decided that a payment of one guinea shall be the composition in lieu of the half-yearly subscription, and it would be a great convenience if those who can would avail themselves of this new Rule.

As some Members of the School, without having any special subject of Natural History for study, were very regular attendants at the Meetings, it was decided that free admission to the Meetings should be given to a certain number of Members of the School, who might also use the Museum and Library. As no subscription or duty was required from them, it was a difficulty to know what to call them. The name of *Medii Socii* was applied to them by the School, and as no other name had been decided on, and this name had come into general use, it was retained. The only modification next half-year will be that the *free* use of the Museum and Library will be withdrawn, and that *Medii Socii* will henceforth have to get a Member to introduce them into the Museum in the same way as any other Member of the School.

The Museum has, through the kindness of friends, been progressing. A new Cabinet of Curiosities has been added; Catalogues of the Birds, Eggs, and Moths have been completed. That of the Geological specimens is still incomplete.

It now only remains to thank those who have kindly contributed in any way to the success of the Society. Amongst those not connected with the School must be mentioned Messrs. T. BROWN and BAKER, of Cambridge, and Messrs. PHELPS, HAWKINS, PERKINS, TURNER, Sergeant ADAMS, W. C. MERRIMAN, Esq., and Rev. J. M. FULLER. Other donations from Members of the School are duly acknowledged in the list of additions to the Museum.

The Committee beg to call the attention of Members to rule 28. Absence from three meetings during the half-year will be considered as coming within the reach of the Rule.

LIST OF MEMBERS.

PRESIDENT:

Rev. T. A. Preston.

SECRETARY:

G. E. Manisty.

TREASURER:

Rev. T. A. Preston.

LIBRARIAN:

E. Almack.

COMMITTEE:

The Ex-officio Members.
C. M. Bull, Esq.
W. D. Fenning.
E. Almack.

HONORARY MEMBERS:

Rev. G. G. Bradley.
A. Armstrong, Esq.
H. M. Moule, Esq.
F. E. Thompson, Esq.
W. E. Mullins, Esq.
C. M. Bull, Esq.
Rev. J. F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq.
F. Storr, Esq.
W. H. Macdonald, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. R. Dumergne, Esq.
R. W. Taylor, Esq.
W. Mansell, Esq.
Rev. W. DeLisle.
R. F. Isaacson, Esq.
W. Koch, Esq.
W. W. Dayman, Esq.
H. A. Evans, Esq.
Rev. J. W. Mills.
E. C. Sewell, Esq.
J. Walker, Esq., M.D.
A. C. Hilton, Esq.
D. E. Leighton, Esq.
W. W. Fowler, Esq.
M. H. Smith, Esq.

MEMBERS:

E. Almack.
J. B. Oakeley.
*J. B. Fuller.
G. E. Manisty.
H. Manders.
A. H. B. Reynardson.
C. A. Sladen.
*E. L. Hesketh.
B. J. Guillemard.
H. S. Sankey.
*W. D. Fenning.
A. de B. Hovell.
*H. J. Verrall.
P. L. Hesketh.
E. H. Wyatt.
H. R. Armstrong.
J. F. Cornish.
H. C. Spry.
J. H. R. Clark.
G. C. Mansel.
T. C. Owen.
E. A. Champneys.
E. F. Vicars.
G. T. P. Cambridge.
L. W. Hinxman.
E. Meyrick.
G. H. Perry.

* Heads of Sections.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members and Honorary Members.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

Management.

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Committee.

7.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in editing the Report.

Secretary.

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

Treasurer.

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

Librarian.

14.—That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

Library.

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

19.—That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purpose of study, provided there be a reasonable excuse for their not belonging to a Section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

Members.

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1s. on election.

25.—That Members have the right to be present, to state their opinions, and a vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

Visitors.

26.—That on such occasions when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

Honorary Members.

27.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

Suspension of Members.

28.—That any member be liable to be excluded from the Society by the Committee if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

29.—That Sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these Sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these Sections shall hold meetings as often as shall seem fit to the Heads of the several Sections, at which any member of the School with the sanction of the Head of that Section, may attend.

Meetings.

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD AUGUST 20TH, 1869.

THE following donations were announced and thanks ordered to be given to the Donors:—

A large Collection of Fossils and of Fossil and Recent Shells, by W. D. Smith, Esq.

Collections of Minerals and Fossils by C. R. Waldron, E. Swetenham, and F. H. Thirlwall.

Coins by A. W. Banks, R. M. B. Glasse, W. A. Eckersley, E. Swetenham, Rev. G. W. De Lisle, and the President.

Humming Birds by C. R. Waldron.

Pair of the rare moth *Collix Sparsata*, by Mr. T. Brown, of Cambridge.

Fresh Water Shells from the Nile, fragment from the Queen's Tomb, at Thebes, and Wild Date, by Mr. T. Baker, of Cambridge, collected by him when acting as naturalist to H.R.H. the Prince of Wales.

Head of Saw-fish, Cloak of South Sea Island Chief, Indian Brush, Esquimaux Arrows, and Play-bills printed on board the "Enterprise" during the Polar Expedition under Captain Collinson, by Mr. Phelps.

E. Almack was elected on the Committee in the place of F. Giles, who had left the School.

There were 22 persons present: 1 Hon. Member, 19 Members, and 2 Visitors.

MEETING HELD SEPTEMBER 3RD, 1869.

THE Heads of Sections gave their Reports, Entomology alone being unrepresented. About 16 plants, new to the College List, had been found since the beginning of the half-year.

The following Donations were announced, and thanks ordered to be given to the Donors:—

Coins by G. H. Dawson, Esq.; Curiosities from Italy, by H. W. Simpkinson; Collections of Foreign Birds, by T. F. Bourdillon and C. R. Waldron.

EXHIBITIONS.

Selections from the Collection of Shells presented by W. D. Smith, Esq.; Hair Balls from the stomachs of a Cow and Calf, by the President; Ashes from the Stacks lately burnt at Huish, by E. H. Wyatt and T. S. F. Battersby.

The President gave a lecture on the Potato, its uses, products, &c., samples of each product being exhibited.

The Librarian announced the addition to the Library of a complete set of the Wiltshire Archæological Magazine, purchased by the Society.

G. T. P. Cambridge and L. W. Hinxman were elected members of the Society.

There were 48 persons present: 2 Hon. Members, 21 Members, and 25 Visitors.

MEETING HELD SEPTEMBER 17TH, 1869.

Zoology.—The President exibited a fine specimen of the Sun Fish, presented by Sergeant Adams, and the hand of a natural mummy, thrown up out of a grave at Arica, in Peru, during the great earthquake of 1868, presented by Dr. Fergus.

Archæology.—W. D. Fenning exhibited the title-page of a book formerly belonging to Frances Seymour, who lived in the Old House, presented by the Rev. G. G. Bradley. For an account of this leaf *vide* the *Marlburian*, Vol. iv., p. 131. E. F. im Thurn, Esq., exhibited some beautiful photographs of the silver plate found at Hildesheim, on the Rhine, in 1868, and supposed to have formed part of the camp equipage of a Roman General.

Geology.—H. J. Verrall gave his Report. E. F. im Thurn, Esq., exhibited a fine collection of minerals, collected by him in the Tyrol. He also presented a specimen of Asparagus Stone in Foliated Talc.

Entomology.—J. B. Fuller passed round a list of notices and exhibited a specimen of the Burying Beetle (*Necrophorus sepultor*).

E. F. im Thurn, Esq., exhibited some Paintings on Cobweb, executed by a Tyrolese artist.

Ornithology.—E. L. Hesketh announced the donation to the Society of a Red-necked Phalarope, by S. W. Featherstone, who shot it in his Father's garden at Marlborough on the 14th inst.; also of a pair of Kentish Plovers and a pair of Sanderlings, by E. F. im Thurn, Esq., who exhibited a Fire-crested Regulus, shot at St. Leonard's, Sussex.

Botany.—H. R. Armstrong, exhibited a specimen of False Oat (*A. Avenaceum*), showing the formation of bulbs at the bases of the stems; F. E. Thompson, Esq., exhibited the Pod of an Indian Pea, and E. F. im Thurn, Esq., a specimen of Papyrus Paper from Syracuse, and of Vegetable Wax from Japan.

E. F. im Thurn, Esq., then read the following paper on his

TOUR THROUGH THE TYROL IN 1869.

I am aware that serious objections can be and in fact have been made to the class of subjects to which my present paper belongs. It has been urged that they are inappropriate, and that they have but little connection with Natural History and the designs of this Society. I cannot help thinking, however, that this is a mistake, for, in the present paper at least, I shall endeavour to point out to you, as far as I am able, the manners, the customs, and the habits of the people, together with the natural and other riches of the country and the various branches of Natural History which may be studied in it.

It thus becomes an enquiry into the life history of a class of people, of a portion of the lords of Creation. Surely this ought to be as interesting to, and as compatible with the designs of, this Society, as an inquiry into the life history of an insect, of a bird, or of any other of the glorious, but at the same time minor, works of the Creator. And this is more than ever the case when the people spoken of are such a "peculiar" people as the Tyrolese, the country spoken of one of the most gloriously beautiful in the world, and one which is as rich, and perhaps richer, than any other European country in Natural History and in Archæolgy.

Such at least is my opinion, and it was with this design and with this object, that I undertook the present task, which I sincerely wish had fallen to the lot of better and more skilful hands. I have up to the present, in order to avoid confusion, spoken of our travels as having been in the Tyrol; they were however by no means confined to the Tyrol proper: and it will now be my endeavour to point out to you the countries, or rather States, through which our route led us. They were three in number, *i.e.*, Salzburg, Carinthia, and the Tyrol proper.

The vast tract of mountainous country, bounded on the north by a comparatively straight line, running along the southern extremities of Bavaria and Wurtemburg, and on the southern by the shores of the Adriatic, is known in England by the collective name of the Eastern Alps. It contains, however, a number of small but very ancient States, belonging for the most part to

Austria, to Italy, or to Bavaria. It is with the three which form the northern part of this district that we are concerned.

Roughly speaking the form of the Tyrol proper may be said to be a triangle, the vertex of which points towards Switzerland. The other two States lie in a line along the base, Salzburg toward the north and Carinthia to the south.

Such then are the relative positions of the three States, of which I am endeavouring to give you a description, towards other countries; the Local Governments, boundaries, and other differences are more difficult of description.

Taking them in order in which we traversed them, Salzburg is the first. This, till the wars of Napoleon, was one of the numerous principalities of the German stock, governed by a Prince-Archbishop, who in tyranny and other particulars appears to have been a true type of the odd mixture of temporal and spiritual rule so common in those days.

The Archbishop still exists, but the other half of his title and of his power has completely vanished, and the state is now a small province of the kingdom of Bavaria.

Carinthia has seen still greater changes of fortune. Formed with two adjoining States into the kingdom of Illyria in 1809 by the decree of the then powerful Napoleon, it fell with him and returned to its allegiance to the Austrian Empire, to whom it now belongs.

But both the previously mentioned States must yield in point of historical interest to the third, which we now come to, the Tyrol proper.

The history of its wars, of its revolutions, of its marvellous victories, and of its final defeat all in the earlier part of the present century, are subjects of European notoriety, and it is only necessary here to remind you that it is now again a province of Austria.

Such then are the geographical and political positions of the three States, and well as the boundaries are marked by actual landmarks, they are still more clearly distinguished by the feelings of the inhabitants, as well as by their patois. A native of Salzburg looks down with a feeling not far removed from contempt on a native of Carinthia, who, however, fully returns it, while they both unite in a feeling but little less strong towards the Tyrolese.

I must beg you to excuse me if I have occupied you too long with politics and geography, but the after part of my paper will be all the easier to understand, and may I trust acquire in this way a little of the interest which it looses through my bad handling of the matter.

After having dawdled away a great part of our time at Brussels, in various towns on the Rhine, at Frankfort and at Munich, we, that is my one companion and myself, arrived at Salzburg in the earlier half of August, and after a short stay in that very beautiful city, started very late one morning to take our first very short walk.

Hallein, a small village about ten miles off, was our first halting place. It lies at the foot of the Dürnberg, a mountain or rather large hill, containing the largest and most celebrated of the salt mines, which are tolerably common in that part of the Austrian dominions.

We arrived there about five o'clock (we had dawdled dreadfully on the way), and as the innkeeper told us there would be plenty of time after dinner to go through the mines, we determined to visit them that night. This was more especially convenient, as it left us at liberty to proceed early the next morning, there being nothing else of interest in the neighbourhood.

Accordingly, we started about six o'clock and ascended for about half an hour to the small village of Dürnberg, near the summit of the hill of the same name. Here is the opening into the mines, a small bricked archway, forming a tunnel just high and wide enough to admit a man of ordinary height. Before being allowed to enter, one is equipped with a suit of white linen clothes, consisting of trowsers, blouse and cap, and with a very thick leathern glove for the right hand, and a wooden lantern containing the dimmest and worst dip that can be imagined.

We proceeded in single file, the guide first, I next, and my companion last. In this order we continued for nearly a quarter of an hour, through galleries so low that I was continually reminded to stoop, by receiving a severe blow on the head. At the end of this passage the shaft, still about the same size, descends at a sharp angle of 48°. Running along the floor of this is a rounded beam, and three feet higher a stout rope is stretched. Sitting astride of this beam and grasping the rope with the gloved hand we began to descend, in the hundredth part of a second we were slipping down at a great speed and in less time than it takes to tell, our feet touched the bottom, having come down a distance of 70 metres* in that short time. The last ten feet of the beam are at an angle of 30° so that the speed is destroyed just as one reaches the bottom.

Another long gallery and another slide of 80 metres and we were in the centre of the mining operations. There our guide lifted a trap-door, and looking down a shaft which descended at right angles, we saw the large brine lake far below illuminated by a few lights, which served rather to increase the darkness by contrast, than to lighten it. We now came to the top of the longest slide, 145 metres. The speed on this was something terrific and notwithstanding the thickness of my glove the rope took the skin off my hand. This landed us within a couple of feet of the brine lake. This is a large sheet of water 150 metres across both ways. The roof of the cavern comes down to within a couple of feet of the water, while there is no particle of light except that from two rows of oil lamps ranged round the sides, which have a most picturesque effect, but are of little use as far as lighting the place goes.

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* One metre—3¼ feet nearly.

Seated on a heavy kind of barge we slowly crossed the lake, moved, it appeared, by invisible hands, for it was only on nearing the opposite shore that I perceived that we were being towed across by an old man with a very long grey beard. This was the crowning point of resemblance, and it must have been a very unimaginative mind indeed to which the whole scene did not convey an impression of the river Styx and of Hades.

On the further side is a small cavern closed by a strong door. In this queer spot exists a very fine collection of minerals, &c., illustrative of the mine, together with some carved monuments of some of the old Prince Archbishops, to whom, by the way, tyrants as they were, monuments are to be seen everywhere. Most interesting of all, however, is a collection of very ancient tools, which were found imbedded in the salt, for the mine has been worked unceasingly since the time of the Romans. I had no paper with me to sketch and so could only attempt one or two on my shirt sleeves, which I have copied out. All the tools of any antiquity are of wood.

We still had one more slide, and then, seated astride on a bench on wheels, we were dragged through a tunnel of about ¾ of a mile in length and just wide enough to admit us. This brought us outside the mountain again, but this time at the foot, not far above the village of Hallein to which we returned very tired, but very much interested.

These mines have been worked for many centuries as is testified by the very ancient implements alluded to above. Their present annual produce is very large, and they as yet show no signs of exhaustion. Their ancient name is Tuval, by which name it is still occasionally spoken of.

We started early the next morning for Werfen, viâ Golling, both of them rather small uninteresting places, but lying in the midst of some very fine scenery. Just after passing Golling, the bed of the Salza is blocked up with some huge masses of rock which have evidently formed part of a bergfall of some magnitude. At one side of the stream just here is situated the small fortress, only used in time of war, known as the Croatenloch, from the fact of its having been held by some Croatian troops under Haspinger, to whose exploits I shall have occasion to allude again. It is a small natural cavern half way up the face of the precipice, so that it can only be approached by a very narrow and much exposed path. Commanding as it does the pass of Tueg and the whole valley of the Salza, the possession of it must have been of the utmost importance during the time of invasion.

The above mentioned narrow pass runs for some little distance along the banks of the Salza, and offers some of the finest scenery to be found in Salzburg. It was Saturday evening when we reached Werfen, and we determined to wait there over Sunday, so that we had thus an opportunity of observing the manners of the inhabitants of this valley. When addressed by a stranger they are most civil and obliging, though not over intelligent, while the women at least are very shy—so much so that unlike the general custom of that part of the world, the men only wished us a good day in passing, and they only even returned our salutation.

Neither the men nor the women can be called good looking, but they were remarkably free from the dreadful goitres so common in those mountain countries.

In this neighbourhood we found the beautiful little pink Cyclamen (*Coum*) in immense quantity, though as usual confined to one spot. It seems to prefer great woods and was growing amongst a profusion of Hepaticas, Hellebore or Christmas rose (*H. Niger*), and the most beautiful *Gentiana Pneumonanthe.*

It is worthy of notice that the Hepaticas were in several instances already in flower. It was also in that part that the pretty little Alpine Selaginella (*S. Helvetica*) was commonest.

On Monday night we slept at St. Johann, a small town with but little of interest connected with it, so that we proceeded the next day to Lend.

On the way we visited the two churches at Bischofshofen, remarkable for their great antiquity. One of them, the Frauenkirche, contains some Roman relics, a good many of which are found in the neighbourhood. One of them, an altar, has been surmounted by a granite basin, and is now used as a Font.

In the same church, on the day we were in it, were some decorations composed of Alpine flowers. The festoons were made of Gentians, of Edelweiss, of Rhododendrons, and various other bright flowers, the whole producing an effect in colour very seldom seen.

The people in this part of the world have a wonderful distrust of money, they were never satisfied with anything but copper coins, and it was most difficult to carry a sufficient supply of these.

A great part of our funds were also in the old krentzers, which are still recognised as legal, but they never would take them at their true value.

On our way from Lend to Taxenbach we found the road blocked up by a "berg-fall" or "landslip" which had come down the previous day. As we were on foot this proved no obstacle to us, as it could easily be scrambled over, but for any traveller using a conveyance it would be most inconvenient.

For the first time during our tour, we experienced a slight inhospitality at Taxenbach; the place was full of Inns, and as we only wanted dinner and were then going to proceed we had not troubled ourselves to make enquiries as to their relative merits, but walked into the first that we saw.

All our ringing of bells had no effect in attracting any attention, and we were at last obliged to walk out and try the next. Our luck was no better, however, for they said we might sit down, and they even consented to bring us beer, but positively refused to procure any viands.

There was however one point of interest in this Inn. The swallows and martins are so tame abroad that they build in the houses, often in the most frequented rooms. In this instance a swallow had built so as to clog up a small bell that hung near the roof whenever this bell was rung; the greatest care was used not to disturb the nest, (which was however very much shaken by the operation), while the birds themselves sat on the bell.

The third inn we tried proved a very pleasant little place, and had for a landlady the only good looking woman that I had seen for a long time.

By a long and most difficult to be found path we reached Rauris after having said good bye to the Salza, along whose valley we had been walking all the time.

It is eminently a mining valley, for, besides the salt-mines, there are in several places copper and iron mines. Its agriculture is poor, at least at this southern end of the valley, the crops consisting chiefly of maize and hay, with but very little corn. At the northern extremity a good deal of corn is grown.

The level of the Rauris Thal (which we now entered), is considerably higher than that of the Salza, from which it is completely shut off by high hills. It is traversed by a single cart track, which is now and then tolerably good for that part of the world, but in most parts is nothing but a corduroy road, which style of track is often to be seen in most of these valleys. The fir trees are just cut down, the branches lopped, and then the trees are laid across the ground to the cost of any one who may have the misfortune to be driven over them.

The present valley is very seldom visited by any but the regular inhabitants, and we, as we trudged along, our knapsacks on our backs, were a constant source of wonder to the very inquisitive inhabitants.

The small town of Rauris is beautifully situated, nestled among the high hills. I have called it a town, as it is said to be such by the inhabitants, though village would seem to be the more appropriate.

We were most hospitably received in the small inn, which, though its exterior appearance was not promising, proved the most comfortable I ever was in. Should any here present ever be in the neighbourhood, I should recommend them to make this their headquarters for a few days.

The landlord supplied us with letters of recommendation to the "hütman" or overseer of the gold mines, which we wished to visit, and with plenty of advice with which we started at 5.30 a.m. Before we left the level of the valley the track passed through rows of wooden palings, on which hundreds of wasps had built their nests.

The nest is always open, and in very few cases were they more than two or three inches in circumference.

The great abundance of the mountain ash was also remarkable. For six hours we wound up and down among the hills seeing an interesting bird or plant occasionally to enliven the way, amongst the former of which an Eagle Owl (*Stryx Bubo*) and numbers of Dippers and Water Ouzels (*C. aquaticus*) were especially observable. As we passed higher and higher we entered the fir forests which were carpeted with bilberries, Alpine strawberries and a most exquisite little partridge berry. At last we reached the small cluster of houses known as Kolm-Saigurn, where are the head-quarters of the miners and where the gold-ore is crushed and extracted by amalgamation in the usual way.

The Kolm consists of four long low huts built under the precipice, which rises for 700 olafters or 4,300 ft. above it.

Of these huts three are devoted to the hütman and the miners, while the other contains the machinery for gold-washing, etc. We had forgotten to bring any provisions with us as we ought to have done, and as we were half-starving we enquired as to whether they could give us anything to eat.

> " But beef is rare within these oxless isles,
> Goat's flesh there is no doubt."

Goat's flesh, brandy, and the hardest of black bread formed our meal. But alas! if the goat of which we were partaking had seen one year, it had seen twenty before it fell to the butcher's knife, and in consequence it gave suggestions by no means of otto of roses. Anything so dreadful it was never my misfortune to come across before, hungry as I was it was impossible to touch it. The hütman was civil enough, though not very polished in his manners or speech, and gave us free permission to use the machinery. Accordingly he conducted us to the back of his house, where there was a small car waiting, the ledge round which was about 1½ feet high. At the bottom of this we lay pressing our feet against the ledge (there was only room for our two selves).

Then we were drawn up by one long rope. The car of course turned up on its edge and we were suspended in an upright position by one rope. In this way we were dragged up precipices which in most instances were at an angle varying from 60° to 80°, and this lasted for seven hundred clafters, or, what will give you a better idea, over three-quarters of a mile. All this was in the midst of the bitterest cold, rain, and snow. When we reached the top we inspected the machinery which drags up this wonderful lift and found it very simple, a wheel moved by water power.

A severe snow-storm had now come on, in the midst of which we walked still higher to the Berghaus, a large desolate building 7,700 ft. above the sea, surrounded by glaciers which approach to within a few feet of it. In this is the entrance to the mine, and here eighty men are constantly at work, winter and summer. Even on that 20th day of August, the wild desolateness of the situation, the blinding snow, thick clouds, bitter cold, and vast expanse of glacier, produced such an awful effect of savageness and hardship, that my mind can scarcely conceive it possible for human beings to spend the winter there. Such is the case, however, though at a great sacrifice of life, for the miners never live long: and even dogs and cats kept up there are said only to live for a few weeks.

We now entered the mine, forcing ourselves through passages reeking with dirt and deep in running water. These galleries were sometimes so slanting that it was impossible to enter without using one's elbow. Then the shaft ascends at a perfect right angle for a distance of 200 clafters, up which run ladders. Up these we had to climb holding on with one hand to the spokes, which were literally dripping with grease, with dirt, and everything horrible, to say nothing of the fact that the shaft was in many places so narrow that it would not admit my body and my lantern at the same time, so that it required some little manœuvring. From this run out the lateral shafts which are now being worked; several of these we visited. Thick veins of gold run along the roof, and the men on their backs or their sides, or in whatever position they can best get at it, pick all day long with small hammer-like tools. Even for us to examine the gold it was necessary to assume the most awkward positions. Then came the worst part, descending the ladders again, for the lantern had to be carried above the head so that the lower depths were lost in darkness; while in many places there were great gaps in the ladders. The outside was however reached at last.

Our object now was to strike across the Goldberg and Hochnarr glaciers to Heiligenblut, in Carinthia, and as it was already three o'clock, we had to hurry in order to cross before nightfall.

We started with one guide over the Goldberg glacier, intending to take the Hochnarr pass. The clouds and snow had however increased to such an extent that it was impossible to see ten yards before us; in consequence of which the guide soon advertised me of the fact that he had lost the way, by telling me suddenly, "Many people lose their way here, and when they do they don't generally find it, they generally fall down crevasses. Two miners were killed here in this way yesterday." It is a curious fact that the Carinthian and Tyrolese guides lose their heads and get frightened in this way much sooner than the Swiss do.

In the course of our wanderings on the Névé I picked up a privet hawk-moth lying on its back and frozen down to the snow. Thinking this an odd place for it, I put it in my pocket handkerchief, intending it for some of my entomological friends.

We were then, I take it, very near the summit of the Goldberg Spitz, and by great good luck managed to find a passable way down. By 7 p.m. we were off the glacier, and taking half an hour's rest in a chalet, more than glad to get delicious milk, butter, and black bread after our long fast. When we reached Döllach at about 9.15. the people at the inn had already retired to rest. They were soon knocked up, and we got to bed. In undressing I was surprised to find my privet hawk-moth had revived, and was apparently as well as possible. The next day found us at Heiligenblut the "head centre" of the best Tyrolean excursions. The visitors' book is full of interesting accounts of adventures; many ludicrous, several mournful, giving accounts of fatal accidents. The interests of Heiligenblut are so great that I dare not linger over them for fear of prolonging my paper beyond its allowable limits. The place takes its name from a sacred relic preserved there with great care. The legend has only once been told in English, by Messrs. Chapman and Hall. As their version has had many accusations of incorrectness brought against it, I venture to give you the following, translated by myself from the inscription in the Church. It will be seen that in my version I have sacrificed every other consideration to literalness.

A SHORT ACCOUNT OF HOW THE BLOOD OF THE SAINTLY BRICCIUS WAS BROUGHT IN A WONDERFUL MANNER FROM CONSTANTINOPLE TO HEILIGENBLUT, A.D. 914.

Briccius was descended from a noble family of the kingdom of Denmark. When still a boy he came with his father to Constantinople, where the latter was enrolled in the Grecian army in order to fight against the Saracens. The father died soon after he had entered the Grecian service, and was obliged to leave the promising youth behind among strangers. Briccius found, however, in the royal commander, Andronicus Ducas, a second father. The youth grew up fast, and gave proof of great piety. Bravery, unsullied virtue, and far-famed deeds, soon won for him the confidence and the goodwill of the discerning Emperor Basilius, which was also bestowed on him by his successor Leo. Briccius fought as a herald in all engagements, shielded by virtue and innocence; he saved the Emperor's daughter Eudonia herself from the hands of ruthless captors, and in all his deeds he remained firm to the tenets of the Catholic faith, which the father had implanted in the susceptible heart of the son. He therefore saw with great grief that religion and virtue itself were not attended to at the Grecian court, and as he thought such a condition to be at variance with his own well-being, he determined to retract his pledge and to beg for permission to depart. The Emperor Leo was not a little displeased at this determination and at first called Briccius an ingrate. "You blame me too severely, most noble Sire," answered Briccius with respect. "Never will the feeling of gratitude towards that noble prince, who taught me to style Greece my second fatherland, die out of my heart. But higher duties call me home, and their call must be sacred to me" ....Leo, softened at this reply, spoke........................."First ask a Princely gift of me"......... "Well," said Briccius, "On the high altar in the church of St. Sophia is a bottle containing the drops of holy blood, which flowed out of a picture of Christ, which had been pierced by an impious Jew. It is that bottle which I ask for." Thereupon said the Emperor, "The patriarch will deliver up to you the holy relic." Briccius clad in pilgrim's clothes, set out by a side way, for fear of the Greeks, who were angry that the holy blood should pass into strange hands. Over the Alps he directed his way to Salzburg, but he only reached the border of this land, for not far from the present village of Heiligenblut, his strength gave way, and after a heavy snowstorm he fell down a corpse. The body was seen by some passing peasants, who brought the body on a cart which they had fetched, intending to bury it in the ordinary God's-acre. But suddenly the oxen stood still; the body was taken off and there buried. But one foot protruded from the grave, on which a bandaged flesh wound was seen containing a small green bottle with some drops of a dark red fluid. Thus the Carinthian Church became possessed of a priceless relic.

I shall not trouble you to follow us in all our wanderings, in the course of which we visited Lienz, Windisch-Matrei, and Pregratten. The latter place is celebrated as a store-house of the rarest minerals of which I procured at different times a fine collection. From here we crossed the very long range of the Dorfer-Sulzbacher glacier between the peaks of the Gross Venediger, Gross Geiger, &c. This is certainly a most magnificent glacier pass, though so long as to require two days. Even though we slept half way at the Johannishütte, we had a good fifteen hours walk to get down to Kriml. Time prevents me from telling you as I had intended of the celebrated Krimler Ache (water fall) or of our adventures in a most violent storm which brought down three vast landslips across our path. We made straight across the country to Innsbruck where we arrived just in time for table d'hote one evening, during the course of which we heard for the first time of the victory of the Oxford crew over the Harvard. That is we did not hear it till seven days after the event. In fact we felt very much the same as poor Rip Van Winkle; we seemed to have been out of the world and its news.

In conclusion let me draw your attention to a very remarkable form of industry practised by a family of peasants near Innsbruck. The large thick cobwebs are collected, sketched on, and a water-colour painting is made on it with a soft camel's hair brush.

These pictures find a ready market at prices varying relatively to the excellence of the work, from four to eight gulden.

F. J. H. Jenkinson resigned, and J. T. Fullerton was elected a member of the Society.

J. B. Fuller was appointed head of the Entomological and E. L. Hesketh of the Ornithological Section.

There were 67 persons present: 3 Hon. Members: 20 Members: and 44 Visitors.

MEETING HELD OCTOBER 1st, 1869.

There were no exhibitions in order to give more time for the following paper by F. Madan, on

THE SOLAR SYSTEM WITH REFERENCE TO THE PLURALITY OF WORLDS.

Some apology is needed at the very outset for introducing to the Natural History Society a subject which does not, strictly speaking, come within the range of its pursuits and is devoid of much of that practical utility which is an essential part in every science learnt at School. Those who know nothing of Astronomy simply think it a very curious science, and think that on looking through telescopes they will see wonderful flaming globes in the sky, that all the fixed stars will be much magnified in size and that the constellations of the Ram and the Bull and such like only require to be seen through a sufficiently large telescope for them to verify their names by their actual appearance. However I am not without precedent in the course which I am pursuing, for no one, I think, found Mr. Rooke's paper last half either uninteresting or useless. There is a difficulty which I feel in approaching the subject, and that is, I do not know how much you yourselves know about it, how much I have to build upon, for some, I fancy, can hardly be supposed to know anything about it, yet the animated discussion which followed the Astronomical Paper read last half-year and the latent knowledge it seemed to bring out after the most violent protestations of total ignorance on the subject which I heard on every side before the paper was read, make me tremble lest some one should rise in the middle of my argument, and triumphantly prove me to have been wholly in the wrong. I will now apply myself to my subject.

In the earliest ages the world on which we dwell was supposed to be the largest body in the universe—it was supposed to be an immense plain, stretching, no one knew how far, in every direction, and just diversified by large mountains and ranges of hills. How the sun managed to penetrate this mass of matter every evening when it sunk, and again every morning when it rose was a profound mystery to all—whether it actually passed through or got round the edge of it, or whether it was extinguished, as the poets sung, in the waters of the western ocean and re-lighted every morning in the east; all this it was found impossible to decide. Below the earth they naturally placed darkness, and all the gloomy horrors of Hades and Tartarus, while above the skies the deities were supposed to dwell in realms of light beyond our ken. The stars were to them only so many bright points studding a crystalline sphere which carried them round every day,—and let them emit a few glimmering rays, and adorn, as it were, the ceiling of our sky. This was the original idea of the universe, shared apparently in the very earliest times by all the races on the face of the earth.

The first occurrences which disturbed the minds of these serene philosophers were the movements of certain of the brightest stars which seemed to possess a motion not only *with the others*, but also independently both of each other and of the rest of the stars. In time came a new theory to help them out of their difficulty and that was the one which later on developed into what is known as the *Ptolemaic System*. Briefly it was this—that the earth was a quiescent globe in the centre of the universe, and that these planets —or, as the word implies, " wandering stars "—which had occasioned the new theory, *revolved round* the earth in so many different spheres placed one above another. The moon was naturally supposed to be the nearest to the earth; then came Mercury, Venus, the Sun, Mars, Jupiter, Saturn, and finally the sphere which carried all the fixed stars. This theory was held for many centuries by all but the Chaldeans—who, as Procter satisfactorily proves in his " Saturn and his System," had a clear notion of the true theory. Indeed it is believed that the accuracy with which the relative distances of the planets were known to the ancients sprang *from* these Chaldeans, who based their knowledge on their truer ideas of the universe.

But unfortunately, to all but the Chaldeans and possibly some other nations of the Semitic family, the motions of the planets were so extremely eccentric in every way, that it required the greatest ingenuity to invent celestial machinery which could even pretend to account for their movements. This was—when fully developed—as I have before hinted—the Ptolemaic System. Some of the difficulties which had to be coped with were these—planets, instead of peaceably revolving in decently circular orbits, not only moved at distinctly varying rates, but sometimes stopped altogether, and sometimes actually moved back; the sun did not rise so high in winter as in summer, and sometimes, perhaps on the eve of a great battle, would be entirely eclipsed. Such amiable eccentricities on the part of the Sun and Planets, instead of making the astronomers cast about for a new system to explain these defects in their existing one, only had the effect of making them multiply their machinery, and attribute checks and stoppages to the existence of friction in various degrees between the crystalline spheres, which I will now describe. Each planet was supposed to be fixed in the *surface* of a vast *hollow ball* or sphere of crystal, and these spheres were placed one on the top of another, revolving independently of each other and with no friction, except when the friction was thought necessary for the reasons given above. So that their universe was exactly like an onion—the earth was in the very middle of all and each succeeding layer in the onion was the crystalline sphere of a planet, while if we make the outside layer speckled, we have the sphere of the fixed stars which bounded all the others. So the next time you eat an onion, pray consider that you are swallowing a model of the Ptolemaic system of the universe. These spheres were technically called "*cycles*" and "*epicycles*," and with the help of a *prime mover*, the great "primum mobile" of the ancients, they went revolving round and round, grinding and pounding away in the sky above us. Cicero, in his "Somnium Scipionis," makes each sphere have a different sound, and to him the "music of the spheres" was no unreality. But to account for our not hearing these celestial harmonies, he supposes we are like the tribes living by the Egyptian Cataracts, who grew deaf from the tremendous sound unceasingly dinned into their ears by the water. You can see at once why these spheres were supposed to be crystal—because it was the only way by which the fact of the fixed stars being seen brightly could be reconciled with the existence of actual material spheres revolving above us.

Well, this Ptolemaic System satisfied the world for many centuries, was pronounced true by the infallible Pope, and remained in possession of the field, till, roughly speaking, Copernicus' time, about 1580. He was the first who dared to make his views of the new theory of the motion of the earth public, but did not live to enjoy its success. Galileo, one of his followers, dared openly to avow his belief in the new System, and was promptly persecuted for it. We all know the story of his being made most solemnly to recant his views and to uphold the immoveable position of the earth, and how as he rose from his knees he whispered to a friend "*and yet* it moves." A similar persecution befel one Spigelius, a bishop of Upsal, for believing in the existence of the antipodes. How was it consistent with the dignity of a Pope to sanction a belief in men who, compared with him, actually had the impudence to stand on their heads? By and by the Copernican System, as it was called from Copernicus its first and foremost supporter, entirely supplanted the old one, and every year it plants fresh conviction of its truth in the minds of scientific men.

The Copernican System in its main features I need hardly describe—that the Sun is the comparatively fixed centre of the Solar System, that Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune revolve round it in nearly circular orbits—and that while the Sun shines by its own light, the planets only reflect the light they receive are facts too well known for it to be necessary for me to dwell on them. I would now propose to take each of the bodies of our System, and point out what will interest you in each. I will begin with the Sun.

The Sun is the only perfectly circular globe, which we *know* to be such, in all the universe. All the planets are more or less oblate spheroids,—that is they appear *flattened* at the poles and bulging out at the equator, like an orange. On the disc of the Sun, we can discern absolutely no deviation from a perfect circle. Of course the chief point worthy of attention in the Sun is the existence of its *spots*.

The photosphere or disc of the Sun appears evenly bright to us, because it dazzles us too much to allow us to see any defects of light, but in reality the smallet telescope, by the aid of a dark glass, will usually show one or more groups of dark black spots on the Sun's surface. The number of spots attains a maximum every 11 years, as was found out by Schwabe, a German astronomer, by induction from daily observations of the Sun for 33 years. For instance, this very summer happens to be one of the periods of maxima of spots, and so the number will gradually diminish from now till the winter of 1874, when they will again increase till 1880. Now this period of 11 years *exactly* tallies with the period of all magnetic variations on the earth, and so we may confidently assume that both of these phenomena have a common origin—perhaps the result of a reaction of the planets on the Sun. Every spot consists of two parts—a perfectly black "umbra" or "nucleus," and a grey "penumbra" as it is called. The shape of these nuclei varies immensely, as also do their permanence and size. You can easily imagine them—perfectly black, irregularly shaped spots, surrounded with greyish borders all round, and dotted about on the disc of the Sun. Into their origin I have not time to go to-night—suffice it to say that they are probably breaks in the burning gas which surrounds the Sun, through which we see the dark body of the Sun itself. There is a great controversy on this subject still going on. From the motion of these spots, the revolution of the Sun on its axis has been found to be nearly 25½ days.

It is noticeable that no parts of the Sun except what we might ironically call the temperate zones have spots: there are none at all near the poles, and very few and brief ones near the equator. I do not maintain the habitability of the Sun, not because it is impossible to conceive it, but from the absence of any proof for or against it. Accordingly the fixed stars, the vast majority of which are themselves Suns, are not believed even by the supporters of the theory of the Plurality of Worlds to be certainly inhabited. And my opponents may say—"Well you say there are no inhabitants of the Sun, and none of the fixed stars. So you exclude all the universe except our own system at one stroke, and yet maintain the general theory of more worlds than one. Why should all the human life of the universe be concentrated on an obscure star in the Milky Way," as our system undoubtedly is. This is what they might say—but I would have these gentlemen observe that it is by no means sure that these fixed stars have no planets revolving round them, invisible to us. Sir John Herschel believed that certain small attendant spots of light near various stars (of which he mentions the names, but which are too technical to name here) are actually planets, and this is extremely probable from their appearance.

Next we will take Mercury, which is generally supposed to be the planet nearest the Sun, and which revolves at a distance of 37,000,000 miles from it. I say *supposed* to be nearest, for there are abundant proofs of the existence of at least one other planet between Mercury and the Sun—partly from circular black bodies being seen in transit over the Sun, and partly from disturbances in Mercury's orbit arising from the attraction of other bodies. The one most certainly known has been called Vulcan, and its period has been actually calculated. On Mercury's surface few discoveries have been made by the telescope, owing to the dazzling splendour of its rays, and to the short interval during which observations on it can be made from its closeness to the horizon; for, its orbit being so small compared with ours, it is never at an angular distance of more than 30° from the Sun, and accordingly even when the Sun is but just setting, its height above the horizon is hardly sufficient to let it escape the vapours and atmospheric disturbances which cling to the earth. The phases, however, by which at one time it appears as a crescent, at others gibbous, as it is called, and at others full, exactly like the phases of the Moon, can be easily seen and also distinct traces of an atmosphere. Mercury, however, has no satellite that we can discover, and it and Mars are the only two in our system which appear to be without any "lesser light to rule the night." Its transits across the Sun are comparatively frequent—there was one on the 6th of November last, and there is an average of one about every six years. Mercury's year is 88 of our days. The light which falls on Mercury is seven times greater than that which the earth receives—and on such facts as this about the relative increase or decrease of light and heat in different planets the opponents of the Plurality of Worlds base many of their arguments. Mr.

Rocke's fervent imagination dictated these words to him about the inhabitants of the inferior planets—"that microscopic creatures with silicious coverings, which are said to be almost indestructible by heat *may tenant* the planets, but of other inhabitants it is absurd to dream." But let me take this one example and show of how little value these remarks are. The light which Mercury receives is seven times that which the earth receives—what use would such eyes as ours be in such a continual and increased brilliancy of light? Well, the *only* change necessary in our eyes would be that instead of the pupil of the eye being one-eighth of an inch in diameter as it is, it should be one-fiftieth of an inch, when we should be able to see with perfect ease and distinctness. This is surely no great change to be made in our nature, yet this is what, according to Mr. Rocke, it is absurd to dream of. I lay stress on this, because it is a perfectly fair example of those crushing arguments brought against us by Mr. Rocke and his adherents, and also of the way in which they may be met. Again, the heat which Mercury receives would be seven times as great as what *we* receive, or, taking the average heat of our globe to be 50° of Fahrenheit, Mercury would enjoy a temperature 138° above boiling point, which sounds pleasant. But in reality, as I have been reminded, the heat received on a globe depends on the diathermancy, as it is called, of the atmosphere, that is, the degree to which the vapours visible and invisible suspended in the air *allow* the heat to pass through them, and also on the degree to which they allow the heat radiated from the globe to escape into the ether above, and thus we have only to imagine a thicker atmosphere on Mercury to make it perfectly inhabitable. Mercury is 300 miles in diameter and its day is within 8 minutes the same as ours. It is therefore the smallest of the planets with the exception of the Asteroids.

Venus is the next planet in order and is the nearest to the earth. Venus is the morning and evening star, called in Greek poetry Phosphor in the one case and Hesperus in the other. It is called *the* morning or evening star for two reasons: 1st because of its excessive brilliancy and apparent size; 2ndly from its always being within 40° of the sun, and it is thus most conspicuous when appearing to lead on the day or follow its departure either before or after it—unlike Jupiter, which is the only planet which can rival Venus in brilliancy. Its distance from the sun is 68,000,000 of miles and its day is about 35 minutes less than our own. As being in some portions of its orbit the nearest planet to ourselves, we might have expected to make the greatest discoveries on its surface—but the extreme brightness of its reflected light has disappointed all the eager search into the nature of its surface. I will quote what Sir John Herschel says of it — which will show the difficulties attending the enquiry. He says the intense lustre of its illuminated part dazzles the sight and exaggerates every imperfection of the telescope: yet we see clearly that its surface is not mottled over with permanent spots, like the moon, we notice in it neither mountains nor shadows, but a uniform brightness, in which we may indeed fancy, or perhaps more than fancy, brighter or obscurer portions, but can seldom or never rest fully satisfied of the fact. Herschel also infers that we do not see, as in the Moon, the real surface of this planet, but only its atmosphere, much loaded with clouds, which may seem to mitigate the otherwise intense glare of their sunshine. I believe Herschel is found to have rather overstated the impossibility of detecting permanent spots, but still the fact remains that we know *very little* of this planet.

Its phases are the most easily discernible feature and these were the first proofs which convinced Galileo of the truth of the Copernican system. To astronomers Venus is celebrated, as the means by which we have determined the distance of the Sun from us—into the method of finding which I have no time to go. The quantity of light received by Venus is about double that of the earth, and it has been found to be attended by a small satellite or Moon. Of our earth I need say nothing, for what does this Natural History Society do, except busy itself with the different sciences which concern the surface and constitution of this planet?

Next we come to the *superior planets*, as those are called which revolve in an orbit larger than our own—as opposed to the *inferior* ones of which I have been speaking. You can at once see the difference in the apparent motions of the two kinds—the inferior planets *can* pass between the Sun and us, as their orbits are smaller, but can *never* appear on the opposite side of the Sun to us.—For example, if you put a sixpence on a shilling and count the rim of the sixpence to be the orbit of an inferior planet and that of the shilling to be our own orbit, you see that no portion of the rim of the sixpence can get *outside* the shilling, as it were. It is the opposite with the superior planets.

Mars is only about half as large as the earth, but presents the most intelligible features of any object within our reach.—All its continents have been mapped out, and names given to the great seas and lands and a Martial map can be traced out with considerable exactitude. The whole planet has a reddish tinge, and I believe it is established as a fact that the earth would have the same tinge, if seen from the moon. The land appears orange, and the seas a dull greyish green, while the proportion of land and water is reversed compared with the earth. Here every continent is an island, there every sea is a lake. I will now approach the most interesting feature of all, and one which gave rise to a violent discussion after Mr. Rocke's paper, and that is the supposed polar snows. There is no doubt of these facts—that white spots have been seen like caps over the poles of Mars, extending about 10° from the pole—that they have been seen to *decrease* during a Martial summer and *increase* during a winter—*alternately* of course as each hemisphere is turned towards the Sun. That the bright light reflected from them might well be from snow; that movements have been observed in the edge of them, and that darker belts often accompany the edges such as might be produced by a *thaw*. After this I see little reason for doubting the existence of snow and consequently an atmosphere analogous to our own. I daresay the doubts raised in the minds of the more learned of my audience will be expressed after the paper.

Of the *Asteroids* I need say little—they are comparatively small globes—above a hundred in number, revolving in nearly equal orbits between Mars and Jupiter. The four chief are known as Juno, Ceres, Pallas, and Vesta. They are supposed to have been the fragments of some large planet, shattered in pieces by an internal convulsion; some of them are about 4 or 5 miles in diameter, while the larger are about 2000. Though the orbits of some of them actually intersect, it is found by higher mathematics, I believe, that it is impossible that there should be a collision. The smaller ones are entirely invisible to the naked eye, and it is curious to think how little planets that we could never see with our eyes have been caught, followed, and identified through the telescope, in a region which would have seemed put by nature beyond our natural reach.

Jupiter is next—the largest body in our system, except the Sun—it is nearly 90,000 miles in diameter, and, in spite of its tremenduous size, revolves in less than 10 hours. The consequence of this is naturally a very great depression at the poles and elevation of the equatorial regions. It is of much less density than the earth, but its immense bulk more than makes up for this—so that instead of the power of gravitation at the surface being less than what *we* feel—as may be expected from the *light* substance of the planet compared with ours—it is actually nearly 2½ times as great. I will speak of the possibility of beings like ourselves living there under so great a pressure when I come to Saturn. Jupiter's year is equal to nearly twelve of ours, and it is nearly at its opposition now—the very bright star to be seen as you come from Chapel in the evenings, just over B house, is Jupiter. Its day is *ten hours* only; on the surface of the planet are always to be seen dark stripes, called Jupiter's belts. They are always nearly parallel with the equator and sometimes change their shape in a few minutes. These belts are the real body of the planet, seen through the great white canopy of clouds which reflect the light of the sun to us. The breaks in the clouds are caused by trade-winds apparently, which are naturally much more violent than on the earth, inasmuch as the movement of the equatorial parts of Jupiter is at the rate of 28,000 miles an hour, while ours is only at the rate of 1,000. Jupiter is attended by four satellites, which revolve round it at different distances,—a moonless night is a thing unknown on Jupiter—for by a curious design the sum of the longitudes of the three nearest satellites to Jupiter is .always 180°, so that if two of the three are below the horizon at any part the third must necessarily be above. The rate at which light travels was first found out by means of these satellites, in this way: the satellites are regularly eclipsed by their primary, they disappear behind Jupiter, and reappear after about three or four hours. Well, it was not hard when the periods of the satellites were known, to calculate when these eclipses would take place—but when Jupiter was farthest from the earth these calculations were *always* 16 minutes wrong. The eclipse was *later* than it should have been, and when Jupiter was *nearest* the earth these 16 minutes of error vanished. And so it was found that light from these satellites took 16 minutes to traverse the diameter of the earth's orbit, that is 184 millions of miles—and hence light was discovered to travel 192,000 miles a second. I will now pass on to Saturn.

Saturn is of all the most *wonderful* planet. It is a little smaller than Jupiter, but has 8 moons and an immense treble ring entirely surrounding the planet at a distance of about 80,000 miles from it. Galileo first saw this ring, but he thought he saw a treble planet—Saturn *between* two globes. The two outer rings are by far the brightest, and are supposed by Procter to be composed entirely of myriads of small satellites wheeling round, *independently* to a great extent of each other. The inner ring is much fainter, and has only recently been discovered. The appearance of the whole to Saturn's inhabitants must be something like that of a vast rainbow in the sky. Yet the thickness of these rings, whose combined breadth is 30,000 miles, is only 100 miles at most, and is almost entirely invisible when its edge is turned towards us. I cannot stay longer on Saturn, in spite of its great interest, as I have hardly justified the second part of the title of my paper yet.

Of Uranus and Neptune I need say nothing, they being too far from us and the sun to present points of any great interest—the light is reflected most dimly from them.

I have no time to speak of many curious facts concerning the Solar System as a whole—of the *regular increase* of distance of each planet from the Sun—of the curious ratio between the periodic time of a planet and that distance, and such like things.

Thus I have in a way scrambled to the edge of the Solar System, through 3,000,000,000 of miles with the universe and its representatives here, sleeping calmly round me. I now have to examine the question of the Plurality of Worlds and Mr. Rocke's paper.

As far as I can make out, my best plan will be this—to leave out the Geological question, which Mr. Rocke introduced, for while I myself am quite incapable of entering into it with sufficient knowledge, there are plenty belonging to the society, to whom it would not be by any means uninteresting and might form a subject for future enquiry independently of refuting specific arguments. I will also restrict myself to those portions of the paper which concern the Solar System.

Mr. Rocke took Neptune, which receives $\frac{1}{900}$ of the light and heat we receive. Well as to the light, if cats and bats have a power of seeing in the dark 20 times, I daresay, as great as our own, and yet this is not thought anything very wonderful, while the eyes as a whole are not out of proportion to the size of the animals themselves, I cannot see that it is a very violent change in human nature to possess eyes which can see 900 times as well as we can.

Besides, listen to what Procter says: "It is probable that our own earth once received much less light than at present. This is indicated by the size of the eye-orbits in many extinct species of animals, and by the development attained by creatures of the bat kind, which now form an insignificant class of the earth's inhabitants. Thus Hugh Miller, speaking of the fossil remains of animals of the secondary division, says 'enormous jaws, bristling with pointed teeth, gape horrid in the stone, *under staring eye sockets a* FULL *foot in diameter.*'" This is what Procter adduces to prove the habitability of *Saturn*, and not much can be said against it.

I will take Saturn as an average specimen of the difficulties fixed on by Mr. Rocke. It seems impossible to doubt that Saturn is inhabited by living creatures of *some* sort. *Here* on our planet we find that not only the earth, but the fathomless depths of ocean, not only the temperate zones but the scorched regions of the tropics are all crowded most abundantly with living creatures,—and also that through many millions of years, during which most startling changes have swept over the earth, the same abundance of life has been found upon its surface. That a globe so stupendous as Saturn—I am quoting Procter's words—and surrounded by a system so magnificent and elaborate should be entirely devoid of inhabitants can hardly, then, be reasonably be imagined. Now on Saturn's *equator*, a human being would feel *no extra* pressure or diminution of the force of gravity, and in the case of other planets, just as birds can combine great lightness with immense strength, so why should not the inhabitants of other worlds? Saturn is not of the density of *cork*, as Mr. Rocke ventured to state, but of *oak*, and if this planet were of oak, we could build houses, &c., very well and find no great inconvenience—unless it caught fire.

The Saturnian Seasons are very like our own; the planet's poles are inclined at an angle 26° 50′ from being perpendicular to the plane of its orbit—while ours are 23° 28′—no great difference. The Rings serve to illuminate the short summer nights and darken the long winter nights, but this indicates no abnormal variation of light or temperature. It is not very pleasant to have an eclipse lasting for 6 years (not 15 as Mr. Rocke observed), as some portions of Saturn do, but they make themselves very comfortable, as I have no doubt.

In our Arctic regions the sun never rises for six months, and I have not yet heard Mr. Rocke argue against their habitability from that cause—perhaps that is to come.

Of Jupiter Mr. Rocke says that it *must be composed of water!* owing to its oblateness of form—well, I have but just explained this, as being the result of extremely rapid rotation on its axis, and on this theory is based all his arguments about it.

Of Mars, he has really said little worthy of refutation. Of his theory of Venus and Mercury, I have already spoken.

The *Moon* is a *satellite*, and not a *planet*. I hope all will bear that in mind; the Moon has a distinct use—to give us light—the planets *cannot* be said to be satellites to the Sun, and so there is a radical difference between the two kinds. The Moon is almost certainly uninhabited. Proctor believes it to be a sheet of ice, and nothing more—it certainly has no atmosphere now, but equally certainly had at one time—a Volcanic Agency, such as we see on its surface, required some vapour or atmosphere for its existence at all. I maintain that we can not argue from the *Moon* to the *planets*, or vice versâ.

Lastly, I come to some positive arguments for the Plurality of Worlds. I will put them in almost syllogistic brevity, as so little time is left.

1. The magnitude of the surface of the planets is 397 times that of the earth or 78,000,000,000 of square miles. Can all this be barren and unhabited? it is surely a gloomy and distorted view of the Creator to suppose it.

2. The general similarity between the bodies of the Solar system seems to point to a similarity of design. They are all splendid, all solid, all revolve round the sun, all turn on their own axis, all derive their lustre from the sun, and are all under the influence of gravitation.

3. Their *special arrangements* are well adapted for the enjoyment of sentient beings. For they possess diversity of scenery, mountains and valleys &c., are environed with atmospheres, have provision for the diffusion of light, heat and colour, and have moons to light them.

4. Every part of nature seems destined for the support of life, matter is framed for the purpose of mind.

5. The theory gives us a more exalted idea of the Creator's wisdom and benevolence and power.

6. No deviation has ever been found from this rule, that whenever any one perfection of the Deity is exhibited, there all His attributes are at work.

7. And lastly, according to the opposite theory, light is distributed to the different planets in vain—in vain is the time measured naturally by days

and years, in vain the seasons are changed, in vain earth's many voices are heard, in vain is heat showered down,—for there is nothing to receive it—perfect barrenness, and interminable solitude are chosen to receive the choicest gifts of the Creator.

I recommend these arguments to the consideration of every one here, who is still awake, and hope that as many last half, were so readily convinced by Mr. Rocke's arguments that there are no inhabitants in other worlds: so they may after due deliberation change their minds and be found at last in that long list of illustrious men, who have found something repugnant to their reason and conscience in the denial of the Plurality of Worlds.

J. W. Hockin and C. F. Harrison were deprived of membership for non-attendance at the meetings during the last and present half-years.

A new rule was made: " That any member absenting himself from three meetings during the Half-year, without sufficient reason, cease to be a member of the Society.

Persons wishing to attend the meetings of the Society, but without any further privileges, may do so by permission of the Committee, which permission will have to be obtained every quarter.

The name of *Medii Socii* has since been given to such persons.

There were 48 persons present: 1 Hon. Member, 23 Members, and 24 Visitors.

MEETING HELD OCTOBER 15TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

South American Whip and Bolas, by W. J. Smythies, Esq.

Coins, by A. P. C. Boevey, J. H. R. Clarke, and C. A. Sladen.

Painting on Talc, by A. C. Hilton, Esq.

Piece of Iron pipe almost entirely filled with Carbonate of Lime, by the Bursar.

Fossils from the Barton Clay, by L. W. Hinxman.

The Exhibitions were:

A mummified slow-worm, found when digging the foundations of the New House; and some celts, lent by the Rev. H. E. Booth.

J. B. Fuller passed round a list of Entomological Notices for September.

T. J. Verrall read the following paper, illustrated by specimens, on

TEAS.

I do not intend this evening to give you a very accurate description of the tea-plant in Linnean botanical terms. We might no doubt find much instruction in a comparasion between Tea and the other plants allied to it, but I do not think my botany would carry me through there, and that would be giving a botanical lecture, not a paper on Tea; so I propose this evening to confine myself to the Tea-plant and those other plants which in different countries are used as substitutes for it. A great pleasure it would be to visit China, the home of a plant which is now so generally used, and so highly and deservedly valued throughout a large portion of Europe and far the larger part of Asia. But if I can shew you a little of the history, uses, commerce, and cultivation of the Tea-plant, I shall be satisfied.

First then to describe the plant itself.

The Tea shrub of China is a plant nearly allied to the Camellia. Its importance depends only on a single species, the "*Thea Sinensis.*" It is naturally 20 or 30 feet high, but when cultivated is rarely more than 5 or 6 ft. The leaves are from two to six inches long and the branches numerous. I tried to find some simple but comprehensive description of the flower, but was met by so many long botanical names, that I gave it up in despair, and must trust to other means for conveying to my hearers some idea of its appearance. The flowers are large, white, and fragrant, and have somewhat the appearance of a large briar-blossom.

Of the Tea-plant there are two recognized kinds, viz., the "*Thea Viridis*" and the "*Thea Bohea.*" Of this last there is a sub-variety called the "*Thea Stricta,*" but many people affirm that it is the same plant.

The places, where it first became known to Europeans, were China and Japan; it has now been introduced into Assam, Java, and also India. The plant must be regarded as naturally sub-tropical, but it can also live in hotter and cooler climates. In China it is thought by the natives to be indigenous, but it has probably been introduced there from the Corea, about the 4th century, A.D. From there its cultivation was extended to Japan about the 9th century, A.D.

Some say mention of tea is made as early as the first century of the Christian era in a book called "The Periplous of the Erythræan Sea" from which the following is quoted.

"But there used to come yearly to the frontier of the Sinoe, a certain people called Sesatæ, with a short body, broad forehead, flat noses, and of a mild aspect. They come with their wives and children, bearing large mats full of leaves resembling those of the vines. When they have arrived in the frontier of the country they stop and spend a few days in festivity, using the mats for lying upon. Then they return to the abode of their countrymen in the interior. The Sinoe next repair to the place and take up the articles which they left, and having drawn out the stalks and fibres they nicely double the leaves, make them into a circular shape and thrust them into the fibres of the seeds. Thus three kinds of malabathrum are formed. That from the larger leaf is called Macrosphœrum, that from the middling one Mesosphœrum, and from the smaller Microsphœrum."

This may refer to the betel-nut but many say it refers to tea.

The earliest place in which certain mention is made of it is in the writing of a traveller, by name Macpherson, in his "History of European Commerce." He says "tea is mentioned as the usual beverage of the Chinese by Soliman, an Arabian merchant, who wrote an account of his eastern travels in the year 850 A.D."

The next mention is in the time of the Jesuits by Maffei and Texeira (both Portuguese). Maffei calls it "chia" a Portuguese rendering of the Chinese "tscha."

In 1615 a Mr. Wickham wrote a letter to a gentleman of the name of Eaton in which we find this passage "send me a jar of the best chaw."

Olearius found it among the Persians, who got it from China by means of the Tartars.

Tea was first taken notice of by the Government of this country in the year 1660; when an act of Parliament was passed in which tea, coffee, and cocoa are mentioned.

Probably the Dutch East India Company were the first to introduce it into Europe. It was at first a very expensive luxury, £10 being the usual price for a lb. of tea. For instance, in 1664 the East India Company purchased 2lb. 2oz. as a present to the King. This shows the rapid spread of the use of tea. It seems rather ludicrous when we remember that an article, of which a lb. was at that time thought a present fit for a king, now transfers to the seventh heaven of delight some old woman at a village school feast.

The East India Company, through having the sole right of trade in that quarter of the globe from which tea was brought, at first realized a large profit by commerce in this plant, and their monopoly was often the cause of too little supply being made for the requirements of the nation. It was not till the reign of George III that any attempt was made to remedy this. Then an Act was passed which made it lawful to grant licences to other persons to supply tea, if at any time that supplied by the Company proved insufficient.

In the year 1657 the first shop for the retailing of tea was opened by a man of the name of Garraway. Tea has always been a taxed article of commerce. The duty laid on it has varied greatly. At first it was 5 shillings per

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lb. After various reductions the duty (as at present) became 6d. per lb. In 1860, the importation into England was 88,946,532 lbs. The re-exportation was 12,087,104 lbs.

There are two sorts of tea, namely black and green.

It was for a long time the prevailing opinion that these were prepared from two separate plants, namely the *Thea Viridis* (green tea) and the *Thea Bohea* (black tea), but from experiments and discoveries which have been made of late, it seems probable that they are the same plant prepared in a different manner. For instance, Mr. Robert Fortune (a botanist who has visited China and made a personal inspection of the modes of growing and drying and exporting tea) says that in the province of Canton nothing is grown but *Thea Bohea* and in the province of Che-kiang nothing but *Thea Viridis*, yet both kinds are made in both these provinces. Again in Fu-kiang or Fokien, though nothing but *Thea Viridis* is grown, only black tea is made. This then proves that the difference is owing to the manner of preparation and not to the nature of the plant. I shall presently, in my description of the preparation of the leaves, give an account of the two methods by which the Chinese can produce either tea from either plant.

I shall now proceed to explain a few of the words which are used to denote the various qualities and kinds; words which are so simple to a native but are very confusing even to Englishmen, who understand the language. In fact they may be said to partake largely of the nature of private marks in an English shop (known only to the initiated). The truth is that many of the thousand and one outlandish names you find in tea-catalogues and inscribed on tea-chests are merely synonyms, used by the Chinese merchants for the avowed purpose of deceiving and cheating their foreign customers.

The word "tea" itself is derived from a Fu-kian word "tia." The usual Chinese word for it is "tscha" or "cha," which the English (as I said before) corrupted into "chaw" and the Portuguese into "chia." The Chinese make 150 names of subvarieties, which number is of course greatly increased in local and provincial dialects. A man of the name of Klaproth has written for the benefit of traders and others, who wish to become well acquainted with the real etymology and orthography of the Chinese tea trade, a sort of dictionary, in which he mentions 40 varieties as genuine, and for further security has given a literal (and I believe correct) description of the leading features which characterize each variety, both as to form, soil, and climate.

The following are the probable derivations of a few common names:—"Souchong" is a corruption of Songlo-tcha (green tea), which is so called from a mountain in the province of Kiang-nan. "Bohea" (black tea) is called so from another mountain Bou-y in Fo-kien; "Pekoe" (Pak-ho) or "White down" from the white fur on the sprouts or leaves of the tea plant in its third year. The Chinese call black tea He-tcha, and green tea Lo-tcha. In English the specific names for green tea are Hyson and Souchong; for black tea the name Bohea is used. Both kinds are exported by the Chinese to a large extent, but green tea chiefly, as the Chinese drink but little of it themselves. The two great emporiums in Europe for the sale of Chinese, and to a certain extent of all tea, are England and Russia. To the latter is sent a great deal of the tea which is gathered when young, for this will not bear a sea voyage necessary to convey it quickly to England. We get chiefly the older and hardier kinds, and this is one reason why, though they do not import so much, the Russian tea is often found to be superior in quality to the ordinary importation into this country. We receive the tea much newer than it is drunk in China, for they consider it unwholesome to drink it before a year has elapsed since the leaf was first gathered from the tree, the peculiar astringent powers of the tea rendering it impossible to drink it when very new. Much of this power is taken from it by packing in the chests and conveying it to England. America also imports a large quantity, and they of course receive it by sea. Some of our re-exportation no doubt goes to America, but we also send tea to our various colonies, for it is now used by the British (both in Great Britain and the colonies), by the Americans, the Dutch, and the Scandinavian nations, who are very fond of it. In Austria and the German nations in general it is considered a powerful medicine rather than a beverage, and is now often prescribed by Austrian physicians for its astringent qualities. In other parts of the world it is only used by the wealthy, and has not yet become a sufficiently prominent article of commerce to render its consumption by the poorer classes possible. It is a great matter of doubt whether the large consumption of tea by the poor of England is not injurious in its effects. There is no doubt that it often does a great deal of good, but the arguments for and against its use I will tell you when I speak of the medicinal properties of the plant.

We now come to a very important division of my Paper; that is the manner of growing and the soils which have been found to suit it best. First then, the soil and situations in which the plant has been grown to most advantage. As a general rule the tops of hills or mountain slopes are best on account of the good current of air. There is one great thing which tea-growers have to guard against, and that is too much irrigation. Though in the rainy season streams run down the hill-sides and over the terraces, cut to sow the seed on, yet there is no danger of any amount accumulating at the roots. When such is the case the roots become rotten and the plant dies. Still instances have been found of the plant thriving in spots which must be always close and damp, and in the rainy season must be positively marshy. In the valleys the air is always too hot.

The soil which is most suitable is one of clay, with vegetable matter, which acts as a manure to propagate the very young plants; and as good a base as any is a sandstone conglomerate.

Though the cultivation of tea is carried on in nearly all parts of China, still the tea-farms are most abundant in the north. They are not and cannot be large, for the preparation of the leaves through the various processes of picking, roasting, drying, and packing occupies so many hands, and each of the processes has a separate building devoted to it. But one proprietor or company of proprietors often holds more than one farm, the management of which is carried on irrespective of one another by separate sets of workmen in separate sets of buildings. If the soil is rich enough no manure is used, as this greatly detracts from the perfection of the aroma on which, in the eyes of the Chinese, depends the value of the tea. Usually no difference in taste ensues, but the loss of the sweet scent is considered by growers themselves and also by many merchants to be a great misfortune. If however the oils is not rich enough manure of silk-worms is used, which are kept for the purpose by the owners of farms, and the manure is carefully spread over the ground.

The seeds are collected in the fall of the year, and carefully stowed away in sand till the following year. I forgot to mention that the earth must be very carefully drained, as too much moisture is fatal to the plants; yet the earth itself must not be too porous or the ground becomes hard and parched, but must be sufficiently porous to ensure proper drainage.

In the spring, following the winter in which the seeds are gathered, they are taken from the sand in which they are preserved, and the sowing commences. Holes are made in the ground at the distance of 4 feet apart. That is, the sets of holes are 4 feet apart, several holes being made close together, and seeds put in them so as to form a good-sized shrub. When the plants are once above ground they are seldom transplanted, as, whether owing to some peculiarity of climate or to the incapacity of Chinese gardeners and the inferiority of Chinese gardening, they never thrive well after they have been moved. The plant itself is an evergreen, but the leaves are not always in the same state of perfection, and so there is a regular season at which the picking takes place. The ordinary time for picking is just after the summer rains, when the new bushes are just beginning to burst into leaf. These are sometimes gathered when quite young, and from them young Hyson is made, which is very fine and delicate, so much so that it will not bear a sea voyage, but is exported overland to Russia. The sun-light and rain influence the tea greatly. For Powchong and Mingehew a bright sunny morning after the evaporation of the dew is required.

The usual picking is at the beginning of May. There is also a second picking, when, the leaves being older, the tea is not so finely flavoured, though in some cases more powerful. There is also a third picking of the poorer produce. The leaves of this gathering are used by the peasantry of the country, but never exported. The later the gathering the more bitter the taste, and the more woody the nature of the leaves. This is one great test of the worth of tea, as the later pickings give out much less soluble matter when water is poured on them. It is well known that, strange as it may appear, none of the sweet scent or flavour of tea is found in the leaves when fresh. This is entirely the result of the manner of drying. It is also the case that the dryers can at will make green or black, good or bad, tea out of the same leaves.

We now come to the drying—that is the preparing, curing, and rolling of the leaves, which brings them into the state in which we see them in our English shop windows. I may as well say here that, as far as I can ascertain, the best books for explaining the mode of cultivation and drying of tea are Mr. R. Fortune's "Tea countries of China" and Johnstone's "Chemistry of Common Life." As there are two main sorts of tea, so there are two main modes of drying. There is also a division into the "wet" and "dry" modes of drying. This sounds rather absurd, but I will explain it presently.

First then of "Green teas."

They are made by roasting the leaves while still fresh in a hot pan for five minutes, at the end of which time they are moist. During this time they are stirred with bamboos. They are then taken from the pans and pressed into a Pyramidal form. In this state they are sunned for a few minutes, and are then opened. The leaves are dried, and the process is repeated. Then they are put into bags and trampled on, stored away in bamboo cases, and after some months spread out till soft. They are then rolled in a cast iron pan, inclined so that the leaves fall back to the rubber. This continues for an hour, after which they are taken out and sifted into three sorts in a bamboo sieve: or else they are winnowed, in the following manner:—the winnow is so contrived that the light dust is blown to the end of the machine and there falls into a trough, the young hyson, slightly heavier, strikes a board nearer the fan, and falls into another trough. The same takes place in order with the Hyson, Gunpowder, and large Gunpowder. The colour, such as it is, is then what is called "fixed." It is at this stage a dull green, but often becomes brighter afterwards. The Chinese, if they do not consider the colour bright enough, colour it artificially; but this comes under the head of tea-adulteration. The Chinese, as I have said before, drink black tea. For green tea great care must be taken to avoid gathering any of the stalk, and a little piece of the leaf is left for the new leaf to grow by.

The mode of preparing "Black tea" is as follows:—

Unlike the green tea, the leaves are allowed to remain spread out in the open air for some time after they are gathered, and are then made flaccid, not by roasting, but by tossing in the air. After that a pan, fixed in mahogany, is made red-hot and the tea is then roasted; three men are employed on each pan, one throws in the leaves, another stands over the pan with a cloth to his mouth to keep out the dust and fumes, rolls them about and brushes them out again, the third man receives the leaves in cloths or baskets. There is not a moment's rest, the three actions going on simultaneously. Another roasting is then given them, a lighted fire underneath the pan keeping it red-hot. The leaves are then pressed with the hands, are put upon square pieces of paper and dried for some hours over a pan of lighted charcoal.

This is the best way of preparing black tea. There are other modes which take less time and trouble, but tea prepared in this way is generally reserved for priests and for festivals. In the gathering of leaves for black tea far less care is needed than for green, as in the former case stalk and all is taken, in the latter only a portion of the leaf. It is not the charcoal fire I mentioned that blackens the leaves, but the long exposure to the air, the oxygen of which acts upon the juice of the leaves. It is thought by some people that the astringent principle in the leaves is favourable to the influence of oxygen but this in very doubtful. Many plants are used to scent tea, of which the chief is the "*Olea fragrans*," whose leaves are of the same colour as our field Cowslip and have a very sweet smell.

The "dry" and "wet" methods are so called from the leaves being in the former case dried without any previous wetting, and in the latter first dipped in hot water and then thrown into pans (half-a-pound to three-quarters of a pound in each pan), and kept well stirred to prevent their scorching. The rolling, which takes place when they are removed from the pans, is generally repeated several times. For black tea the dry method is adopted, for green tea the wet. The leaves are, I need hardly say, much diminished in size by the preparation (three pounds of undried leaves producing one pound of dried). The wet method diminishes the leaves most, and on this account the larger leaves are used. The Chinese are very careful that the tea should not be in any way rendered impure; the collectors are not allowed to use their bare hands but wear gloves, and before the picking are kept on very strict diet, not taking fish or any food likely to taint the breath. Teas, when they are flat, are, I believe, sometimes moistened and re-rolled. The teas when dried are packed away and exported in the curiously painted chests which we see. Though the foreign trade carried on by the Chinese merchants is very large, yet their home transactions are on a still larger scale. The amount of tea consumed by the Chinese is enormous; they keep it, not in wooden chests, but in fine porcelain jars with narrow mouths for the sake of preserving the aroma they prize so highly.

We now come to an important question,—the adulteration of tea.

It was for a long time thought that this was the work of dishonest shopkeepers only, and that they made a trade of adulterating tea with various kinds of English leaves easily procurable, but it has now been clearly proved that the adulteration must be put down in a great measure to the Chinese themselves. They often colour it artificially to make a good price. At one time they even went so far as to own the fraud, and a company was formed for the sale of what were termed "Lie Teas," that is an inferior quality coloured so as to imitate a better. But it did not succeed. The reduction in price was not sufficient to tempt people to the wholesale consumption of artificially coloured tea. The tea is coloured by means of Prussian blue, gypsum, and indigo, (the latter is considered harmless, and is now generally used). The work of colouring is considered of great importance and to require great skill and care. The foreman of the works always pounds and mixes the Prussian blue or gypsum, (as the case may be), and then the workmen take the powder in their hands and rub it over the tea. For a long time the idea was entertained that the green colour of the leaves was due to their being dried over heated copper plates. But there is every reason to believe that this mode is never adopted. I am not at all sure that it would produce the effect desired. Here I will quote an interesting experiment from the book I mentioned just now (Johnson's Chemistry), for determining whether Prussian blue or indigo is employed. He says "if a portion of the tea be shaken with cold water and thrown upon a bit of muslin the fine colouring matter will pass through the muslin and settle at the bottom of the water, when the water is poured off the blue matter may be treated with chlorine or a solution of chloride of lime. If it is bleached it is indigo; if potash makes it brown and a few drops of sulphuric acid make it blue again, it is Prussian blue." The Chinese gather enormous quantities of leaves of other plants to mix with the true tea leaves, and these are put in whole or in dust. In both cases the requisite flavour of tea is given. In England sloe leaves are very commonly used for adulterating tea. Iron dust is also put in to increase the weight of the tea.

A few names given to tea by the Chinese may perhaps be amusing. For instance, of the Chinese teas we find Gunpowder, Pin's Head, Shanghae, Hyson, Mogun. These are all names of Green teas. Of Black teas, we have Flowery Pekoe, Scented Orange, Plain Orange, Souchong, and in Java a particular and rather rare kind called Imperial, in the shape of small round balls. The leaf of the best kind used for presents is called Cumshaw, and is either twisted and tied up like a cigar, or twisted up in paper balls.

The analysis of tea as found at the South Kensington Food Collection (on which you heard so interesting a lecture last half), is Water, Flesh-formers, Heat-givers, and mineral matter; but a more minute analysis is as follows:—Water, Theine, Caseine, Tannin, Gum, Sugar, Starch, Aromatic Oil, Fat, Fibre, and the mineral substances. Of these I will at once proceed to describe some of the most important.

Theine is an alkaloid found in both tea and coffee, as well as in other substitutes for tea and coffee. It has no smell; in taste it is slightly bitter. Though this is not a flesh-former, yet it is a flesh-preserver—that is, it diminishes the amount of waste that the body is continually undergoing both internally and externally. So it in reality nourishes in a negative way, for less food is required according as there is less loss of flesh and bodily tissue. If any one wishes to procure theine there is a very simple method which I have read of. Procure some tea leaves and put them either whole or finely powdered on a watch-glass and then cover them with a paper cone. If you then place the whole on some heated substance such as a hot plate or even a spirit lamp, you will see a white vapour rise gradually and condense on the sides of the cone in the form of minute crystals of Theine.

Caseine is the same element that forms the nutritious part of cheese, and is in fact named from that. In tea its proportion is about 15 per cent., but the whole of it is not extracted by the ordinary method of pouring boiling water on the leaves. A little Carbonate of Soda will help to extract the Caseine. The Tartars have an ingenious method of using up the whole nutritious portion of the tea. They collect the tea leaves and put them in moulds. To this they add salt, fat, milk, butter, and roasted meal, and then put water to it. This is what is called Brick tea, and is consumed by the Tartars to a large extent.

Of Tannin there is about 13 per cent. in common tea. It is this that gives tea its astringent power. To the Aromatic or Volatile oil tea owes its colour and flavour, and it is this predominating too much (combined with Tannin) that prevents the Chinese from drinking Green tea when very new.

Tea Substitutes are plants of which the leaves, fruit, or bark are used for tea in countries where tea itself is not cultivated. They may be divided into two classes. I. Those with Theine. II. Those without it.

Of Class I, I will mention four of the principal.

I. Maté or Paraguay tea. This plant is not, as was once supposed, the *Ilex Vomitoria* of N. America, but the *Ilex Paraguanensis*, a small shrub about the size of an orange-tree; in fact the *Ilex Maté* of St. Hilaire growing wild in Paraguay. The Spaniards call it "*Yerva maté.*" It is not cultivated, but negroes are hired by merchants to pick it off the wild trees. The branches are cut off and dried on heated turf. There are three different kinds—namely, Caa-cuys, the bud of the leaf; Caa-mini, the leaf torn off from the trees, and not roasted; Caa-guazu, the whole leaf and small twigs roasted. The *Ilex Vomitoria*, a plant of the same nature, is used to purify water. Francia, in his governorship of Paraguay, forbade the use of Maté, and a Brazilian plant was used for it, but it did not succeed so well.

II. Guarana. A plant used in Austria and France for the purpose of extracting Theine as a medicine.

III. Coffee leaves. The unpleasant smell of these leaves prevents their more general use. They are chiefly used in the West Indies.

IV. The Kola-nut. About this nut a paper has been written by Doctor Daniell. He says:—"It is sold in Central Africa, where it is used as a medicine by white settlers." He first discovered its properties by the insomnia which resulted from a draught of it. Negroes are very fond of it, and it is in many places grown for their use. When mixed with impure water it renders the taste agreeable.

Of Class II. there are the Siberian, Apallachian, Labrador, Chilian, Trinidad tea, and the Partridge-berry of N. America. The use of these is not sufficiently general to make any account of them worth while. Sage leaves are also used as a substitute for tea.

The tea substitutes of Mauritius are sufficiently numerous to deserve special mention.

I. Culen or Koulin, a plant used for poultices and as a remedy for asthma and oppression of the chest. The leaf is also smoked like tobacco.

II. Faham, used for medicine. M. Fleurot says:—"The crystals are in small groups of rectangular prisms, which are soluble in boiling water, and much more so in heated alcohol or ether."

III. Jamaica Vervain. This plant is sometimes sold as Brazilian tea.

IV. Thé du Mexique.

V. Citronelle or Lemon Grass. Really a native of India. It is used as a remedy for sickness. It is often cultivated in Botanical gardens.

VI. Capillaire. A fern which grows in dry rocky places. Bernardin de St. Pierre, in his "Paul and Virginia," the scene of which is laid in the Mauritius or Isle of France, often talks of "Capillaire." Whether he knew it as a tea substitute or not, I of course cannot say.

There are two more plants which from their relation to tea I must mention.

I. Salep. The root tubers of several species of orchis are used. The younger of the two root tubers is gathered, when the stalk is about to fall. These tubers vary from the size of a cherry to that of an olive. They are cleaned and peeled by dipping in hot water, and the brown skin is rubbed off with a cloth or brush. The tubers being thus cleaned and peeled, are arranged on a tin plate, and then placed within an oven, heated as for baking bread. Here they are to remain for seven or ten minutes, in which time they will exchange their opaque and milky whiteness for a semi-transparent horn-like appearance, and a yellowish colour, retaining their original bulk. Being then withdrawn from the oven, they are exposed for some days to dry and harden in the air, or by the employment of a very gentle heat they may be brought to the same state in the course of a few hours. All that is then required to adapt the Salep for food is to boil it in water (or milk) to the required consistency. (Library of Entertaining Knowledge).

The ordinary genus is *Eulophia*, but nearly every European orchis can be used. About 30 years ago, before coffee became general, it was sold of a morning to the working classes of London. It is still used in France.

II. Sassafras (*Lauraceæ*), This plant grows in N. America, but is there merely a bush. In S. America, however, it grows to the height of 50 feet. The wood is soft, light, coarse in fibre, in colour dirty white or reddish brown, of a strong but agreeable smell, and of a sweet taste. The wood is used in chips, mixed with the root, which is very strongly flavoured. The bark is used as a medicine for gout. It also makes capital mucilage for thickening soup.

Several attempts have been made to introduce the tea plant into other countries, and of these I will mention one or two.

It was about the year 1836 that the tea plant was first cultivated in India, chiefly in the two provinces of Kumaor and Gurhwal. In Mr. Fortune's account of the valley of the Deyra in Kumaor, he says :—"The soil of the valley is composed of clay, sand, and vegetable matter, resting upon a gravelly subsoil, consisting of limestone, sandstone, clay-slate and quartz rock." This valley seems to present features the very opposite to those usually considered favourable to tea. It is flat; the air is very hot and the ground very wet. In Guddouli in Gurhwal the tea will grow, but not so well as at Deyra. Still there seems a strong probability that some day we shall get much more tea from India than from China, as the former is much more accessible.

Attempts have also been made in Ceylon and S. Carolina. Here the soil seems to be good but there is a lack of good workmen. It has been thought that the slopes of the Himalayan mountains, on account of their varying elevation, would be suitable, and it has been further suggested that the plant might be cultivated to advantage in the S. of Africa at the Cape of Good Hope.

In Assam the natives eat so much opium that they are too lazy for work.

Medicinal properties. The nature of tea is at once stimulant and sedative, and it also possesses great astringent qualities. It may be used as a stimulant, but may also be given moderately in cases of restlessness. It is not alcoholic but no doubt excess in tea drinking produces a thirst for alcoholic drinks. It is a good antidote to opium and has often been used with success in cases of poisoning. By some medical men it is recommended for fevers and heart disease. It is very much like coffee and cocoa, in fact the analysis I gave just now is also the analysis of coffee and cocoa, and for this reason cocoa is often recommended when coffee and tea do not suit the constitution.

In conclusion I will quote Jonas Hanway's amusing remarks against, and Dr. Johnson's for, tea.

The one says. "Men seem to have lost their stature and women their beauty. What Shakespeare ascribes to the concealment of love is in this age more frequently occasioned by the use of tea.

The other, in the *Literary Magazine*, describes himself in the following words.

"A hardened and shameless tea-drinker, who for twenty years diluted his meals with only the infusion of this fascinating plant: whose kettle had scarcely time to cool; who with tea amused the evening, with tea solaced the night, and with tea welcomed the morning."

I must thank all my hearers for the attention they have given me and the President in particular for the loan of his specimens without which I could have done but little.

There were 72 persons present; 1 Hon. Member, 28 Members, and 43 Visitors.

MEETING HELD OCTOBER 29TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:

Ammonite, and Indian Corn, by H. T. King.
Pendent Wasp's Nest, by F. Head.
Butterflies (*A. Paphia*, &c.,) by G. E. Manisty.
Death's Head Hawk-moth (*A. Atropos)*, by the President.
Two Greek Coins, by E. W. Swetenham.
The first Report of the Wellington College N.H.S., by the Society.
"On the Teaching of Physical Science in Public Schools," by the Author, Rev. W. Tuckwell.

W. D .Fenning then read the following paper, written by J. F. Cornish, on

TORCROSS, (DEVONSHIRE).

AT the commencement of this Paper I must apologize to all for the absence of Natural History in it; my plea for this omission is ignorance, ignorance of Natural History generally, as well as ignorance of any particular branch, but having heard and profited by so many interesting papers in this room, I should hardly feel justified in leaving the College without trying to tell you something and interest you in some measure; and may you pass kindly criticism on this my attempt! The spot about which I shall tell you to-night is a Hamlet in the extreme south of Devon, situated in Start Bay, at equal distances from a point you may see in an atlas—Start Point Lighthouse—and an inconsiderable headland called "the Mew-stone": in case this bay gives you no idea of the position of Torcross, let me say that the Start Bay adjoins a bay of some celebrity in history and fame, for its beautiful scenery and formation—Torbay. There is no railway station nearer to this gem of a place than Dartmouth, a distance of eight miles, and this is, to me, a great recommendation, for besides being out of the way of smoke and objectionable hangers-on to a train, one has no temptation to move thence in the course of a whole vacation, so much so that though I have spent eighteen summers there, I have only once slept more than one night away from my accustomed abode. Until some six years ago there was no rail within sixteen miles, whether halving that distance was an advantage or not, I leave for others to decide.

I fear when I once enter on the subject of Torcross I shall not only attempt to describe the nature and peculiarities of the place, but that I shall "twaddle" on about manners and men and in fact about everything that interests and strikes me about it, and by so doing I hope to stir up a desire in those of you who inhabit the west to make a little tour to this spot; if you do this on the strength of the paltry recommendations publicly given here, your troublesome journey through beautiful country will be amply rewarded. If you cannot possibly feel interest in it pity and perhaps pardon me for supposing that you could. Thence did I come to begin this Half-year, and I hope that I may be able to impart to some a portion of my knowledge of and love for the place, since certainly increased familiarity has not increased my contempt for it.

This Hamlet is close by the sea, a veritable sea-side place, and, naturally, its inhabitants are fishermen, the population, however, is not much above two hundred, so little is true merit appreciated.

To begin with the sea, which must in such a spot be the leading characteristic; it is of the usual greeny-blue colour, but is distinguished from its nature at adjoining places by being being beautifully clear; some here may have followed the South Devon line as far as Dawlish or Teignmouth, where the sea has by no means the recommendation of clear transparency, which it possesses in Start Bay. Those who see it in the summer have not the best opportunity for observing this clearness, for annually, in July or August, the sea in that part, as the fishermen express it, "*clan'th* itself." Whether this process takes place annually at other sea-side places I have not enquired, or what is the explanation of the change that comes over its clear water, but in quite calm weather about the time that I mentioned above, lines or banks of sea-weed appear near the shore in regular lines, of which perhaps there are three within sight of the shore; this is objectionable for bathing, for seaweed, if pretty to look at and talk about in poetry, is by no means pleasant stuff to cling to one's body and impede arms and legs, and of course with the usually hidden weed comes up much foul stuff that quite spoils, so to speak, the sea's complexion; this annual attack of jaundice lasts some two or three weeks and leaves the sea more beautifully clear than before, which is some compensation. One would imagine such phenomena to be merely the result of storms, but the other day I could trace this annual attack to no such cause, and I could call the process by no more true, if more refined, word than the "claning," of the fishermen.

The distance from the focus of my description, Torcross, to Start Point is, by water, some three miles: some four miles of rugged roads but romantic and beautiful scenery, conduct the traveller thither on foot: to ride or drive thither is a physical impossibility for man or beast. To the celebrated, secret, Dartmouth Harbour the distance is some six miles by sea; the entrance to this harbour, I must explain, is as it were a "slit" in the rocks that skirt the sea between the "Mew-stone" and Torcross, which has the advantage of making the Harbour a very hidden one, perhaps, indeed, rather too much hidden for vessels that under stress of weather yearn to make the harbour. The tides in this bay are most convenient for bathing purposes, for instead of, as is the case at many places, the tide running to the shore and from it, it runs up and down, that is, towards the Mew-stone when it flows and towards the "Start" when it ebbs, so that in swimming out to sea the bather need not fear the adverse run of the tide for his inward course, but finds each way equally easy; in fact, except in Spring tides, the tide makes very little difference in the position of the swimmer either in the upward or downward direction. The only point at which the tide is in any degree powerful is round Start Point, where it runs, I am told, at the rate of eight or twelve miles an hour: I can say from experience that to be in a small boat with only one companion just off the promontory and trying to pull against the tide is anything but an enviable position: in fact it makes one feel rather small and feeble, for the tide besides running against the boat carries it at a good pace though almost imperceptibly out to sea, and should not the rowers be tolerably expert, the tide will not leave the boat till it had been whirled some mile or so out to sea where the tide is less furious and powerful.

Just on the other side of the Start is *Prawle* Bay, which is rather a pet place for wrecks; the vessel that, when the wind is inshore, gets into this bay never can beat out again, but, after some dire struggles, is dashed upon the grim rocks which always look ready to grind anything and everything to powder. Since the Start Lighthouse has been erected I suppose about one wreck a year has been the average, but before that! well, I cannot say, for I was not alive to tell the tale. *Apropos* of wrecks, nothing can be a better "spec" for the poor fishermen, who, though scrupulously honest as a rule, pick up and carry off all the things they can: their idea is, that if they don't take the things the Preventive Officers will, and keep them too, so of this they hardly see the point, but, going at night, get all the things they can and, rushing home through wind and rain, bury the spoil in their gardens or some adjacent bit of ground, so that when the Preventive, or Custom-House officers make search in the house, they find nothing. The annual wreck came off last February, and in consequence when I was in my usual haunts in the holidays, I saw in almost every cottage some remnant of the wreck—this was a "*wrack*" handkerchief, that a "*wrack*" pair of boots (for luckily the ship having a general cargo, each one's wants were supplied). It was regarded as a general grievance that the sea and rocks had somewhat spoiled the articles. Some years ago a Russian ship "the Daniel" was wrecked, and a woman feelingly told me that "she did'nt know what they should all have done if it hadn't been for th' old Dannull." The same person, by the bye, was much scandalized, because though there was a *pig* on the Russian ship, the sailors did not call it a *pig* but had some "furient" name for it.

It is possible to fish from the shore for conger eels, bass, etc., and almost possible to catch a few; a long line is obtained and a lump of lead attached to one end, whence go two hooks tied on to smaller gear; a loop near the lead is seized and whirled in the air and sent flying into the sea at a distance of some 20 or 30 feet: caution must be used, for a friend of mine caught the hooks into the fleshy part of his person and thus caught himself; the knife had to be resorted to and the hook extracted.

Having thus as it were come in from the sea let us look at the beach and see its nature: it is remarkably shelving that is to say there is by no means a gradual decline from the ridge of the beach to the water, but so sudden that bathing in the sea, clean though it is, is not very enjoyable unless you can swim, for the scope of action is very limited, three or four slips being enough to take the bather hopelessly out of his depth; but I must not forget that, from the age of about five to ten, I used to enjoy my bathe as much as anybody, although swimming was then, naturally, a delight unknown to me, and it is clear that more than two slips then would probably have carried me to a watery grave. How I managed to teach myself to swim there, I know not, but as such a problem is not of universal interest I need not here try to unravel it. Another disadvantage resulting from the steep nature of the beach is the difficulty, which the men experience in pulling up their boats, which, though by no means large, require six or seven men to drag them out of the way of the tide when they come in tired from their day's work: perhaps an account of their day's work may not be altogether uninteresting: their day begins at different times according to the time at which the tides serve for the outward voyage, but it is something between 12 p.m. and 6 a.m. generally about 3 or 4 a.m. The boats are launched—the bait and lines being ready—and off the little squadron of eight boats goes: they generally sail and anchor in company for safety's sake: there are various fishing grounds; one about ten miles distant, the others less: they anchor at the spot for some five hours and then sail in again: men with carts are ready to buy the fish and carry them over the country for sale—these are the 'Chow-ters'—the derivation or meaning of the word I am ignorant of.

After a nutritious meal of bread soaked in hot water, flavoured in prosperous times with an onion or carrot, the men go to bed, where they sleep an hour or so: they have a frugal dinner and then 'dawdle,' collect in groups which resemble Quakers' meetings, as far as any conversation is concerned: it is a splendid sight to see their tanned, grim features clothed with an expression of mystery: often have I, seeing the fire thus kindle, gone up expecting to hear some wondrous theory propounded or philosophical question put; when, after a few tobacco-puffs, some mild and sphinx-like remark about the weather has been the only result of all the cogitation and contortion. About four or five p.m. they go in large boats, about eight men in a boat, to catch bait, which they call "Lants." This name, I believe, is peculiar to the bay, but they are the same sort of thing as sand eels, and I am sure I admire the good taste and acute palates of the fish, for the Lants certainly are very good: a net is thrown out not far from the shore and the men, assisted by the women (who are in a state of "*squaw-like*," but happy, subjection) draw it to the shore.

I must add that their submission is, so to speak, physical: they do the hard and dirty work and have to trudge a long way to the "hauls," while their husbands row; but they, as a rule, keep the purse, manage all household affairs, study domestic economy with painful accuracy, and always "play the Aaron" when visitors and gentlefolks come in: the men are reserved, sheepish, and oracular—in fact almost dumb before strangers: and it is only upon acquaintance that the splendid simplicity and strict morality of their ideas comes out.

After some three or four "Hauls" enough has been got, as a rule, for bait and some for sale: the bait is divided among the men, the nets stowed away and home all come: the men, after their second salt-drenching for the day, have completed their day's work and can go to bed as soon as they please: they do not please, however, till about nine or ten o'clock and then in a few hours their day begins again. Sometimes I have returned after unwonted dissipation at about 12 or 1 o'clock and seen the boats in the dim moonlight going out to sea and the pretty sight has given a gentle rebuke to my late hours, for here are these men who have worked hard all day beginning their day when I am ending mine: I am afraid however this thought has not driven away sleep. The accidents that happen to these boats are few and far between, for being so small they seem to stand in danger, but for the last four years there has not been one. There is a larger sort of boat used for a different purpose a "drift boat" which is manned by three (while the smaller is manned by two) partners. The "drift" boats carry nets, drift-nets, whence their name, and go off in the Autumn to a distance of some miles to try for pilchards which ought to 'mesh' in the nets as they drift astern of the boats with the tide: the mesh being of an ordained size, the smaller fish pass through: in good seasons the profits are considerable, one boat catching some thousands a night: those that cannot be sold are "salted in" for home consumption and sustain the families during winter: the life though, when from home, is very rough, for they sleep anywhere or nowhere, since the boats are too small to sleep in comfortably and the men have not money enough to go to an Hotel.

Besides the "Hooking" boats and "Drift" boats, there are "Seine" boats, which are longer and stronger, and are used for the purposes of net fishing, either for Mackerel, which appear more or less in July and create great excitement in the village, or for a general cargo, so to speak, of fish, with a net, called an "Inch-net": on such an occasion the boat goes some mile or so from the land and encloses in its net a most incongruous assembly of finny creatures: these nets take some long time to be hauled in, two hours or more: I doubt whether the fishermen are rewarded for the trouble but spectators certainly are, for the most unearthly specimens appear: all species of shell fish, sea-pigs, and all manner of edible and inedible fish: and what is better fun on a slight scale than to hear the simple but bombastic remarks of Cockneys who happen to be lodging near the scene of action? How they startle the "natives" (not oysters) by their remarks indicative of ignorance surpassed only by bombast. And while I enumerate the greatest oddities to be seen in the "motley crew" of fishes shall I forget thee, O cuttle, that lookest so innocent and harmless, till some white-waiscoated visitor takes thee up condescendingly, when with one mighty effort thou contractest thy muscles and in an instant sendest a mighty stream of thy own peculiar ink over that erst virgin waistcoat? Oh, the inimitable look of pity and contempt then depicted on the faces of the natives! If by thy squirts and fliks, O cuttle, thou hast made an enemy, thou hast made one that will never molest thy inky tribe again. It is interesting to know that these murky creatures are provided with back bones which have the peculiar quality of ink-erasing: so that if you are but polite to a cuttle-fish it may perchance present you with its elegant backbone in order to remove the stains which its trifling ebullitions have caused before.

On Sunday evenings may often be seen a line of backs appearing at intervals on the surface of the sea not far from land: these are the porpoises playing "leap frog" or "leap-porpoise" for a joke. It is strange that these creatures should appear on Sunday evenings, but I have remarked this to be their favourite day. I suppose they are religious and after having had puritanical sermons, their minds require recreation which they obtain in this game of leap-frog: some people say that they are harbingers of wet weather, others, of gloomy weather, but I should say that they are as much harbingers of the next day *i.e.* that the wet or stormy weather is not more accelerated or caused by their frolics and gambols than the advent of the next day is.

In the winter there is sometimes oyster dredging, but of late years this pursuit has hardly repaid the trouble. By the shore, partly exposed at low tide are the "limpet rocks," so called from the plenteous covering of that creature: there is plenty of weed about them and holes worked in the rock by some means which now serve as houses for crabs—proper, edible, red crabs; to catch, or try to catch, these is no bad fun; they creep to the end of the hole, sometimes several feet long, at high tide and there abide till the water is about to leave the hole: the weapon for catching them is popularly called a 'gaff,' a stick about a yard, long armed with a large barbed hook which is to be inserted into the hole. If a crab be there it is probably hooked out in a few minutes after losing a claw or so: let me however warn all against being as foolhardy as I was at the early age of ten.

I had heard a great deal about these crabs, how good to eat and hard to catch, and had seen some caught, and, thought I, why not I as well as others? So off I went, found one in a hole, of tolerable size: one rather important part I had forgotten, a 'gaff': however I put in my hand, but instead of my catching the crab, the crab caught me in the middle of my right hand with one of its big claws; the hole being large, I pulled the creature out as it hung on my hand, and tried to shake it off: that however did not 'pay' at all for it clung the tighter and gave good promise of making its pincers meet in my palm. I was helpless for my right hand was incapacitated and my left very weak: I should have had to walk home some half mile in pain with this parasite had not a herculean gentleman been there, who with some difficulty released me. Well I remember my dastardly revenge on the brute which I thought very plucky : the skin of my hand was broken and the blood running and to this day have remained the marks to remind me to take some implement when intending to get a crab. I have heard that a man on these same rocks was as foolish as I was and less lucky, for he got his hand and arm deep into the hole and was there detained by a crab. The water rose and there he was almost afloat and in some pain, when just as he was about to get a knife to try to saw his arm off, and thus escape, leaving a feast for the crab, that creature kindly let him go. But if I detail such horrors I shall quite spoil your night's rest with phantoms of creatures that enjoy eating you as much as you enjoy eating them. The adjoining hamlets to Torcross supply London chiefly with crabs, which they catch off the Start in crab-pots. Few perhaps have seen a full-sized crab, certainly never in Mr. Harraway's shop, where the largest are mere pigmies, though very likely to be as expensive as the full-grown produce of Start Point, which cost 2s. or 2s. 6d.

I feel that in giving these odds and ends I may be accused of laying down the law in these matters and addressing you as people who are quite ignorant of these things: but Torcross is such an out of the way place that a few things I may say about its customs and its inhabitants may be as little generally known as things done in "Ultimis Gadibus" or the Island of Patmos. The crab-catching is carried on by the fishermen of two adjoining Hamlets, which are near the Start Point. Some few may not know the look of a crab-pot, and as it is simple and efficacious, perhaps I may try to describe one and explain how it acts. It is made of wicker work and stands about two or three feet high : a hole at the top and a neck inverted as it were, so that, though nothing is easier for a crab than to get in, it is impossible to get out. In those pots are put slices of dog-fish and the more inferior sorts of fish, raw of course—yards and yards of rope are attached sufficient to stretch from the bottom of the sea where the crabs lie (always on rocky bottoms) to the surface, several corks, of the size of a Kennedy's Latin Grammar, float attached to the rope at the top of the water to show the spot where the crab-pots lie : some are three miles out to sea, at or near Start Point, and some at a far greater distance : these have to be visited every day to remove the crabs already caught and to change the bait : the crabs are then brought in and put into a pot which is quite near to the shore, where the crabs can stay and live till required for the neighbourhood or for Billingsgate, for, as I said before, the greater part of the London crab market is supplied thence. As coals, perhaps, are hard to get at Newcastle, so it is very hard to obtain, for love or money, crabs at this place where they are caught *by thousands*, as the London market makes a large demand. Of course all know that crabs must not be allowed to die : that is to say, they must be killed and boiled almost immediately, or, if compassion for the stolid representative of the shell creation is not in your composition, let the boiling water bubble the creature's requiem. At the end of the week these creatures are packed in hampers and sent to Dartmouth by cart and thence to London by rail. The crab trade would be very lucrative were it not for the losses sustained in rough weather, for when the storm comes suddenly, the sea carries off the pots before they can be brought to land and dashes them to pieces on some shore or throws them in the way of a channel ship, which picks them up. As a daily visit must be paid to the crab pots, these boats, which are no longer than the Torcross boats, have sometimes to face dreadful weather or resign themselves to the loss of their source of livelihood. Fortune with her eyes wide open seems to protect and preserve these cockle-shells as they toss in a storm: they are always on the move, for there is no need of anchoring for the few minutes stay, which suffices to pull up, examine, and re-bait the pots.

Going from the beach we come to the rocks, the cliffs, which are formed of blue slate veined with quartz. They give the idea of being "everlasting hills" as compared with the crumbling sandstone cliffs which surround Dawlish and the adjoining places, which the traveller passes on the South Devon Coast Railway. Though perhaps quite unintentionally, they give one the idea of being on the point of toppling down on the train and passengers as they pass. Near Torcross, in the days of the ancient Romans, an attempt was made to quarry for the slate: some progress was made and the attempt was given up: after some years or centuries attempts have been renewed at intervals and continued until a late date: all failed from the difficulty of carting or conveying the slate away. Two gloomy, stagnant pools, are the only result: in fact the cliff is disfigured greatly by the late excavations, while the cuttings made until quite lately have been covered with verdure green and brushwood, and look rather grand. This same quarry is a grand place for rabbits and Jackdaws or '*Chalks*,' as they are called there in imitation of their hoarse utterance.

The great peculiarity of the place Torcross is that the sea is separated from a fresh water lake, a ley as they call it, which runs almost parallel to the sea for two or three miles: this is the "Slupton Ley," which is famed for the quantity of fish it contains, but not for their quality: Pike, Perch and Roach abound, but in the summer the water is so low that mud is the distinguishing feature of their taste and their condition is poor, owing to the quantity of mouths, and paucity of material to fill them. The Pike are of an enormous size, but hideously coarse to the palate. A narrow belt of sand, about 150 yards wide, separates the two, and in the winter the high winds drive the sea into the ley and kill many of the fish—rather a mercy! I believe that in one other place there is a like phenomenon, but I know not where. In the winter when the sea is high the cottages are in great danger, for though rustic cottages, according to poets, ought to be strong and neat and in good repair, most of these are "tumble down" and a tolerable wave might obliterate them. The sea, for a joke, sometimes bursts a door open and fills the kitchen with a foot or so of water—a foot deep, I mean. Occasionally the inhabitants have to escape by the back way to avoid a death by drowning, for, strange to say, hardly any can swim: chiefly, I suppose, because there is great need of it. May I be pardoned for inserting a characteristic speech of an old woman of 70 something, who told me the saying herself with great gusto. A grandson came to take her out of bed, on one of these stormy nights when the cottage was in danger: and in reply to his petition she said: "Now: 'ere I be, and 'ere I'll bide: and if the Loard plaisth to knack down the house, let'un knack me down with 'un, and there *us'll* * all be togither." These are her words which may need a translation to non-Devonians. She said, "*No:* here I am and here I will abide: and if the Lord is pleased to knock down the house, let him knock me down with it, and there we shall all be together." Of course the beautiful pathos of the sentiment is quite lost in the '*construe*' so to speak. It is almost needless to state that these people are quite uneducated and cannot imagine how much their children will lose by being educated. The rich vein of mother wit that most of these uncouth beings (especially the women) have is quite astonishing: and a woman, who gravely told me that some place was destroyed by some folks they called the Danes nigh two or three hundred years ago, would create considerable laughter among any but the most stolid and astonish all by her wondrous insight into character and keen appreciation of the ludicrous. Now that I have wandered so far I might as well add a few more genuine Torcross sayings: A French ship some years ago had run ashore at Torcross: the authoress of most of these sayings, and of many which I forget, complained of the indistinct gibberish of the sailors on board the ill-fated ship: I apologized for them saying that they talked French, a language which she could not possibly understand or speak: She looked incredulous: I suggested again that she was an unfair judge, for she could not speak French—"Oh but" said she, with a knowing grin and unconscious cleverness, "You see, I never tried"!

Being uneducated, each has the charm of perfect originality, whereas their children will, I fear, be servants etc. and all painfully alike morally and intellectually as well as physically. The dire effect of education is beginning to be seen already: the children are very "uppish" and finely dressed, and refuse to fish as their fathers fished before them, and the consequence is that the number of "Hooking boats" has gradually and is still gradually diminishing. The children, I believe, think that trade is the great thing as that may get them to London, and in London all must be rich. In the winter, when the sea is too rough for any sort of fishing, the men have to degrade themselves to stone-breaking, etc., for naturally the farmers do not want men in the winter months, when little is to be done, who cannot work for them in the busy days of harvest.

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* Who the us'll all is, is not apparent.

How they live I cannot tell, and were it not for some good Samaritans they would not live to tell either. Unless there has been a good Pilchard season, bread, hot water and old tea-leaves form their staple food, and the wife of a man working on the roads told me that he earned 10s. a week and that the bread bill each week for the family amounted to 8s.: so luxuries and almost life are out of the question. In a winter a few years ago great misery prevailed, the family of an old friend was in great distress, and death from starvation seemed imminent, and the woman, conscious of her own integrity, felt inclined to rail at Providence: the way she expressed her feelings to me afterwards were splendid: "Oh well! 'twas shocking times! but there you see we got through it! well there's one thing I've often mistristed the Lord afore, but I'll never mistrist 'un any longer"! Comments on such a sketch of primæval morality would be needless.

Further and further must I wander: *apropos* of French, I may tell a story which has probably never travelled from Torcross to Marlborough: an old gardener was taking a friend of mine round a garden and came to the flower commonly called "Dog's Tooth," the gardener, proud of his Latin lore, said "Yes 'tis called Dens Canis," and volunteering a construe, added Dens Dog Canis tooth Dog's tooth: this story was repeated to an old lady as a joke, who, in an apologetic voice, excused the old gardener by saying "Oh you see the poor old man never learnt French"!

But really I have wandered a vast way from Natural History, as I was afraid I should when I took this subject in hand. Now let us see how each branch of Natural History is represented in South Devon. I began the last holidays with the full intention of getting a collection of sea-weeds (which grow in great profusion on the Limpet Rocks) and of keeping an aquarium, and so procuring a quantity of pickled sea anemonies to present to this Society, but you only, who know what resolutions for activity each of us makes for the summer holidays and each time deceives himself, can pardon me for coming here again empty handed, without sea-weed, sea creatures or moths, of which there are certainly great quantities. I am not entomologist enough to say whether they are all alike or whether there are some rare sorts: nature is so kind to Devon generally that she most probably has not been stingy with moths: my idea was that in these last holidays I should go to Devon, provided with net and boxes and pins and *hoc genus omne*: but alas! I forgot all this at the right time and so, thus unprovided what could I do! for the place is so out of the way, that nothing can be got with ease. Butterflies are certainly very plentiful in the lanes but somewhat monotonous, for there do not appear to be many kinds.

As to Botany, this region is wonderfully provided with flowers, which I admire but cannot understand and describe: those who may happen to have seen a book on this subject, of good apearance and good matter, "Flora Devoniensis," will see the vast profusion and variety.

Ornithologists will have little to do or admire in South Devon: Yellow Hammers, Sparrows, Blackbirds, and Water Wagtails are the only birds that appear at all often, especially the latter, which swarm on every lawn. Paucity of trees may account for this deficiency and also the relentless persecution of the farmers, who kill off the birds under a mistaken notion that the birds destroy the trees and crops.

On Archæology I might have tried to lecture, or rather give hints on this subject, to night, but after Fenning's lecture on Coins and Archæology generally, such an effort would be absurd. In the last winter after the storms, on some sand near Torcross, a few gold pieces were picked up: this provoked search and a good quanity were found of some two or three hundred years old: the strange thing was that they were as new as if they had been struck at the mint the day before; it is supposed that a ship laden with chests of *bullion* was wrecked here years ago: that these chests remained stolidly at the bottom of the sea buried in sand until these storms, joined to a peculiar tide, washed off the sand, burst the chests and sent up the *coins*. I did not hear of this directly, being in the north, but on being told of this "find" and being a Collector I wrote off directly to a fisherman begging him to keep all he could find for me to inspect and buy: he found several, but I suppose good offers were made by Connoisseurs and the absent candidate was forgotten.

I hope that people will not think that I am anxious to tell of my great deeds, but I played a part in a chase which may form an interesting fact in ornithology. At Torcross one day at the beginning of the last holidays, from our house I saw what appeared to be a 'diver' in the sea; someone however told me that he had heard the "whirr" of a pheasant passing over the house and that it had fallen into the sea. It was evening, so that I could hardly see what it was: taking its pheasantism for granted, I set off, knowing that it could not rise from the water although it would be a good hand at swimming: I seized a towel, ran off, got to the water and swam out some fifty yards to cut it off. The bird was evidently out of its element, with a vengeance, not being accustomed to sea-water, or to me in the water; seeing, that is to say, a fearful head, it swam very fast for a bird, and I swam very slowly for a human being, but overtook it; as I approached, it looked alarmed and uttered its last "crow:" I seized it by the neck and held it under water for several minutes—its wings beat me unpleasantly at first but when it became more quiet I swam in with it when I discovered it to be a fine, good-sized cock pheasant. I kept tolerably quiet about it, since it was out of season; but it tasted none the worse for that. I think a case of poaching could hardly have been made out, as I certainly was on nobody's ground, however no one tried to make out a case, so I cannot tell. A fortnight ago a man wrote a letter to the *Field* saying that he had caught four partridges in the sea, but accounted for their presence there on the hypothesis of their being fatigued: I sent an account of my experience (which was too late for insertion), and gave it as my idea that the birds do not see the nature of the water till they are so close as to be unable to escape: once there, of course they are "done for," as the pheasant of my acquaintance was.

The great event of the year is the regatta which comes off in the summer, August or September; it is a day of gaiety and shows and filth, which makes great havoc in the quiet village. The sailing races are much as they are at other places but the quiet and vegetable existence of the men is shown by the fact that three or four boats enter for the rowing prizes, and "to avoid extra exertion" they arrange beforehand to divide the prize-money for the several prizes equally, whichever boat proves the victor: this dislike of exertion and want of jealousy, or even emulation, are charming characteristics.

I must pray forgiveness in conclusion for the absence of Natural History, properly so-called, my excuse I have given before. This paper is a mere disjointed collection of points, well imprinted on my mind, about the place and the people, of which the recollection is to me pleasant: I only hope here and there among the rubbish some odd and end may strike you as news, and that you may feel to have a distant interest in the fortunes and manners of these inhabitants of "Ultima Thule" and a desire to see, what from my description of it perhaps you would hardly guess to be, one of the most lovely little places in England: my experience of other places is so limited that I should not dare to say this except on the authority of those who in the course of long travels have happened to light upon this little gem set in cliffs and sea.

E. Meyrick and G. H. Perry were elected Members of the Society, and L. W. Fox, H. B. Steel, C. F. de Jersey, and W. C. Adams, were elected *Medii Socii.*

There were 49 persons present: 1 Hon. Member, 19 Members, 4 *Medii Socii*, and 25 Visitors.

MEETING HELD NOVEMBER 12TH, 1869.

W. C. Merriman, Esq., presented an Ostrich Egg, Nest of the Oriole, and two pairs of Horns of the Klip-Springer, from S. Africa, and thanks ordered to be given for the same.

H. S. Sankey exhibited a Brazilian Beetle.

E. F. Vicars read a Paper, written by W. D. Fenning, on "The Study of Natural History in London."

There were 49 persons present: 1 Hon. Member, 19 Members, 4 *Medii Socii*, and 25 Visitors.

MEETING HELD NOVEMBER 26TH, 1869.

A bank-note of ten kreutzers was presented by R. Mann, and a coin, found at Aldbourne, by Mr. Perkins.

A paper was read A. de B. Hovell, on Avebury.

There were 37 persons present: 1 Hon. Member, 21 Members, 2 *Medii Socii*, and 13 Visitors.

MEETING HELD DECEMBER 10TH, 1869.

There were no exhibitions in order to give more time for Mr. Geo. Whittall's lecture on Phrenology, which he practically illustrated by experiments on two of those present, the truth of his deductions being acknowledged by all.

There were 101 persons present: 5 Hon. Members, 24 Members, 4 *Medii Socii*, and 68 Visitors.

MEETING HELD DECEMBER 13TH, 1869.

This was a private meeting to discuss the work of the past half-year, and to make arrangements for papers, &c., next year. A very fair number of Members agreed to prepare papers during the holidays.

ARCHÆOLOGY.

This section has not been at all lively this half-year; a new Cabinet, however, has been added by the Society, which contains all the curiosities, previously contained in the table cases, and all the other similar objects presented this half-year. The coin collection has not been much added to, the increase being chiefly in tokens and foreign coins. W. E Swetenham presented two ancient Greek coins, at present the only ones of the kind in the possession of the Society.

ENTOMOLOGICAL NOTICES.

Names of those whose initials occur in the following List:—

A.W.B.	A. W. Banks
C.B.	Mr. C. Brampton
C.M.B.	C. M. Bull, Esq.
A.C.C.	A. C. Champneys
J.H.R.C.	J. H. R. Clark
C.J.C.	C. J. Cole
W.F.	W. Fergus, Esq., M.D.
R.F.	R. Francis
J.B.F.	J. B. Fuller
E.L.H.	E. L. Hesketh
A.H.	A. Hoffman
H.M.	H. Manders
W.M.	W. Mansell, Esq.
G.C.M.	G. C. Mansel
G.E.M.	G. E. Mew
E.M.	E. Meyrick
C.P.N.	C. P. Nash
T.A.P.	Rev. T. A. Preston
E.S.P.	E. S. Preston.
A.H.B.R.	A. H. B. Reynardson
H.S.	H. Sieveking
C.A.S.	C. A. Sladen
J.S.	Rev. J. Sowerby
H.C.S.	H. C. Spry
J.S.T.	Rev. T. S. Thomas.
F.E.T.	F. E. Thompson, Esq.
H.J.V.	H. J. Verrall.
C.B.W.	C B. Woolcombe

RHOPALOCERA.

Gonepteryx Rhamni	Brimstone	Aug. 11	J.S.
		Aug. 19	F.E.T.
Colias Edusa	Clouded Yellow	Aug. 15	H.M.
Pieris Rapæ	Small White	Nov. 19	(late) R.F.
Vanessa Atalanta	Red Admiral	Oct. 31	(late) J.B.F.—E.L.H.
V. Urticæ	Small Tortoise-shell	Nov. 19	(late) R.F.
Argynnis Paphia	Silver-washed Fritillary	Aug. 22	(late) J.S.
Thecla Quercus	Purple Hairstreak	Aug. 24	J.B.F.
Chrysophanus Phlæas	Small Copper	Aug. 20	J.S.
Polyommatus Argiolus	Holly Blue	Aug. 25	second brood J.B.F.
P. Corydon	Chalk-hill Blue		
P. Agestis	Brown Argus	Aug. 24	second brood A.C.C.

SPHINGINA.

Smerinthus Ocellatus	Eyed Hawk	Aug. 27	larva
S. Populi	Poplar Hawk	Aug. 15	larva G.E.M.
S. Tiliæ	Lime Hawk	Aug. 24	larva H.S.
Acherontia Atropos	Death's Head Hawk	Oct. 5	
Sphinx Convolvuli	Convolvulus Hawk	Oct. 9	C.A.S.
S. Ligustri	Privet Hawk	Aug. 15	larva W.F.
Chærocampa Elpenor	Large Elephant Hawk	Aug. 12	larva C.B.
Macroglossa Stellatarum	Hummingbird Hawk	Oct. 17	(seen) A.H.B.R.
Sesia Fuciformis	Broad-bordered Clearwing	July 1—7	

BOMBYCINA.

Pygæra Bucephala	Buff tip	Aug. 23	larva C.P.N.
Arctia Caja	Tiger Moth	Aug. 15	moth C.J.C.
Dasychira Pudibunda	Pale Tussock	Sept. 15	larva A.H.
Orgyia antiqua	Vapourer	Aug. 18	moth C.B.W.
		Aug. 21	larva J.S.T.
Pœcilocampa populi	December moth	Dec. 13	C.M.B.

NOCTUINA.

Acronycta Psi	Dagger	Aug. 18	larva
Bryophila perla		Aug. 20	H.J.V.
Heliophobus Popularis		Aug. 26	J.B.F.

Luperina Testacea		Aug. 18	T.A.P.
Apamea Oculea		Aug. 24	J.B.F.
Rusina tenebrosa		Aug. 26	J.B.F.
Agrotis Tritici		Aug. 23	E.M.
Cerastis Vaccinii		Oct. 13	Mrs. Hood
Phlogophora Meticulosa	Angle shades	Sept. 24	G.C.M.
Amphipyra Tragopogonis	Mouse	Aug. 19	E.S.P.
Mania Maura		Aug. 17	H.C.S.
Catocala Nupta	Red Underwing		

GEOMETRINA.

Rumia Cratægata	Brimstone Moth	Sep. 3	A.W.B.
Ennomos Angularia		Aug. 22	C.P.N.
Asthena candidata		Aug. 24	J.B.F.
Oporabia dilutata		Oct. 2	H.J.V.
Melanthia Ocellata	Purple bar	Aug. 24	J.B.F.
Cidaria Miata		Oct. 1	W.M.
C. Russata		Aug. 29	T.A.P.
C. Fluctuata		Aug. 29	T.A.P.
C. Ferrugata		Aug. 24	E.L.H.
Scotosia Dubitata		Sept. 25	J.H.R.C.
Cheimatobia Brumata	Winter Moth		J.S.T.

PTEROPHORINA.

Alucita Polydactyla	Many plume	Aug. 28	H.J.V.

REMARKS.

In the Rhopalocera we have only to notice the capture of *P. Corydon*, a butterfly new to our list, at Glory Ann, and that *P. Argiolus* has been observed in a new locality, the College bathing place. Before this year this butterfly (*Argiolus*) was quite unknown to our list, but it has now become singularly plentiful.

In the Sphingina *Ligustri* has been taken feeding on holly and box, by W. Fergus, Esq., and other specimens were found by Miss A. Bradley, Rev. J. S. Thomas, and others.

We have also to notice the capture of the Death's-head Hawk *(Atropos)*. A pair of the Clearwing Hawk (*Fuciformis*) was taken at Savernake House during the holidays.

On August 15th a pendent wasp's nest, deserted, was found by F. W. Head near the Forest.

A Hornet was found on October 3rd, by J. H. Garland.

And the last Wasp seen on November 1st, by H. Power.

The curious corn parasite *(Vibrio tritici)* has been observed at Devizes, and at Ramsbury, by E. Meyrick, in both which places much harm was done to the crop.

We may also mention that A. W. Banks had two silkworm moths, a male and female, come out of the same cocoon which probably they had spun together.

A box of moths has been presented by Rev. J. W. Mills.

GEOLOGY.

The following papers have been read before the Section during the Half-year:

Date

Sept. 10th, by W. E. Mullins, Esq., on "The present mode of studying Geology."

Sept. 24th, by J. B. Fuller, on "The Geology of Weymouth and the Isle of Portland."

Oct. 22nd, by S. B. Dixon, Esq., on "The Somersetshire Coal-Fields."

Nov. 5th, by H. J. Verrall, on "The Geology of Sussex and the Denudation of the Weald."

Dec. 3rd, by Rev. J. F. Bright, on "Some Mammalian remains from Thame."

ORNITHOLOGICAL NOTICES.

Falco subbuteo ...	Hobby hawk ...	... ...	(shot).
Lanius excubitor...	Great Grey Shrike...	... ...	(shot) Nov. 20.
Turdus pilaris ...	Field-fare ...	J. B. Oakeley	seen (early) Nov. 7.
Turdus iliacus ...	Redwing ...	J. B. Oakeley	seen (early) Nov. 26.
Hirundo rustica ..	Swallow	F. Strickland	seen (late) Nov. 11.
Hirundo urbica ...	House Martin...	J. B. Fuller H. J. Verrall	seen (late) Nov. 1.
Phœnicura ruticilla	Redstart... ...	J. B. Oakeley	seen (late) Oct. 31.
Motacilla boarula...	Grey Wagtail...	... ...	shot, Nov. and Dec.
Scolopax gallinago	Common Snipe	J. B. Oakeley	seen (early) Sept. 11.
Phalaropus lobatus	Grey Phalarope	S. Featherstone	Sept. 14.
Fratercula arctica	Puffin	... ...	Oct. 25.

There has not been much out-door work done this half-year, so the list of notices is rather small; but in it there are some worth mentioning as *Phalaropus lobatus*, which was shot by Featherstone, and *Lanius excubitor*, obtained at Poulton, and *Fratercula arctica* (Puffin), two specimens of which were obtained, one caught by hand and the other found dead, nearly all of which are new species to our list.

The following birds have been added to the collection.—

10 Indian birds, by F. W. Bourdillon.
4 Humming birds and 5 New Zealand birds, by C. R. Waldron.
2 Kentish Plovers (*Charadrius cantianus*), by E. im Thurn, Esq.
2 Sanderlings (*Charadrius calidris*), by E. im Thurn, Esq.
Red-backed Shrike (*Lanius collurio*) by Rev. T. A. Preston.
Grey Phalarope (*Phalaropus lobatus*), by S. Featherstone.
Redbreast (*Erythaca rubecula*), by J. B. Fuller.

BOTANICAL NOTICES.

There never has been a more favourable season for Botanical purposes than that which has just passed. The number of new species and new localities is enormous, and it is to be regretted, therefore, that members of the School were not more active. From the subjoined lists it will be seen that most of the work was done by only two or three. So much of our district has yet to be worked that it is clear we have not by any means exhausted our Flora. Most of the additions to our list require to be well looked for. The areas upon which they grow are exceedingly small, and can therefore be very easily overlooked, and it is to be hoped that next year will see more workers, and, if possible, more results.

Names of those who have contributed towards the perfection of the list:—

D. Coles, Rev. G. W. De Lisle, J. B. Fuller, J. H. Garland, C. R. Gunner, E. L. Hesketh, G. C. Mansel, E. S. Preston, Rev. J. Sowerby (J. S. in list), F. E. Thompson, Esq. (F. E. T. in list), H. J. Verrall, and J. S. Wood.

The Calendar has been worked out after a plan suggested by the Rugby School Natural History Society; the double letters indicate that the plant was plentiful—thus aa, indicates that it was plentiful in August, ss, in September, &c.—A letter in brackets indicates that the plant was really past flowering, but that a few flowers were still out.

Clematis					
vitalba	a	s	—	—	—
Ranunculus					
heterophyllus	a	—	—	—	—
peltatus	a	—	—	—	—
flammula	—	s	o	—	—
acris	aa	ss	oo	nn	d
repens	aa	ss	oo	n	—
arvensis	—	—	—	n	d
*lingua	a	s	—	—	—
Caltha					
palustris	—	s	o	—	—
Papaver					
rhœas	aa	ss	oo	—	—
dubium	a	s	o	—	—
Lecoqii	a	s	—	—	—
Chelidonium					
majus	a	—	—	—	—
Fumaria					
officinalis	aa	s	oo	n	d
Nasturtium					
officinale	aa	s	o	n	—
palustre	—	—	o	—	—
Sisymbrium					
officinale	a	s	o	—	—
thalianum	—	—	—	n	—
Alliaria					
officinalis	a	—	—	—	—
Erysimum					
cheiranthoides	a	—	—	—	—
Brassica					
oleracea	—	—	o	n	—
campestris	—	s	o	n	—
Sinapis					
arvensis	aa	ss	oo	nn	d
alba	aa	s	o	n	—
Lepidium					
campestre	a	s	o	n	—
Capsella					
bursa-pastoris	aa	ss	oo	nn	d
Isatis					
*tinctoria	a	s	o	n	—
Raphanus					
Raphanistrum	a	s	o	n	—
Reseda					
lutea	a	s	—	—	—
luteola	—	—	o	—	—
Helianthemum					
vulgare	a	s	o	n	—
Viola					
odorata (alba)	—	s	—	n	—
Reichenbachiana	—	—	o	n	—
Riviniana	a	—	o	n	—
tricolor	—	—	—	n	—
(var) arvensis	aa	ss	oo	nn	d
Polygala					
vulgaris	a	s	—	—	—
Cucubalus					
*bacciferus	a	—	—	—	—
Silene					
inflata	a	—	—	—	—
Lychnis					
flos-cuculi	—	s	o	—	—
vespertina	aa	ss	o	—	—
diurna	a	s	oo	n	—
Githago	—	s	—	—	—
Sagina					
procumbens	—	s	—	—	—
Arenaria					
serpyllifolia	—	—	o	n	—
leptoclados	a	—	o	—	—
Stellaria					
media	aa	ss	oo	nn	d
graminea	a	—	—	—	—
Malachium					
aquaticum	a	—	—	—	—
Cerastium					
glomeratum	—	—	—	n	—
triviale	aa	ss	oo	nn	d
Malva					
moschata	a	s	o	—	—
sylvestris	aa	ss	oo	n	—

rotundifolia	aa	s	o	n	d
Hypericum					
*calycinum	a	—	—	—	—
*Androsæmum	a	—	—	—	—
quadrangulum	a	s	—	—	—
perforatum	a	s	o	n	—
humifusum	a	—	—	—	—
hirsutum	a	s	—	—	—
pulchrum	a	—	o	—	—
Geranium					
*sylvaticum	a	—	o	—	—
pratense	aa	s	o	n	—
dissectum	a	s	—	n	—
columbinum	a	—	o	—	—
rotundifolium	a	—	o	n	—
molle	a	s	o	n	—
lucidum	a	—	—	—	—
Robertianum	aa	ss	o	n	—
Linum					
Catharticum	aa	s	o	—	—
Oxalis					
corniculata	—	—	o	—	—
Ulex					
europæus	—	—	oo	n	d
nanus	—	s	o	—	—
Ononis					
arvensis	aa	—	—	—	—
Medicago					
lupulina	aa	ss	o	—	—
Trofolium					
pratense	aa	ss	oo	n	—
arvense	—	s	—	—	—
repens	aa	ss	oo	n	—
procumbens	aa	s	o	—	—
minus	a	s	o	—	—
Lotus					
corniculatus	aa	s	o	—	—
major	a	s	o	—	—
Anthyllis					
vulneraria	a	s	—	—	—

Vicia					
Cracca	a	s	—	—	—
hirsuta	—	s	—	—	—
gracilis	—	s	—	—	—
sylvatica	a	—	—	—	—
sepium	a	s	o	n	—
sativa	a	s	—	—	—
Lathyrus					
pratensis	aa	s	—	—	—
Onobrychis					
sativa	aa	—	o	—	—
Spiræa					
ulmaria	aa	ss	oo	n	—
Agrimonia					
eupatoria	aa	s	o	—	—
odorata	a	—	—	—	—
Alchemilla					
arvensis	—	—	—	n	d
Sibbaldia					
*procumbens	a	—	o	—	—
Potentilla					
anserina	a	s	—	—	—
reptans	a	s	—	—	—
Tormentilla	a	s	o	n	—
Fragaria					
vesca	a	s	—	n	—
Rubus					
discolor	a	ss	—	—	—
cæsius	aa	s	o	—	—
Geum					
urbanun	aa	s	oo	n	—
rivale	—	—	—	n	—
Rosa					
arvensis	—	—	—	n	—
Lythrum					
salicaria	a	—	—	—	—
Eplobium					
hirsutum	aa	s	—	—	—
parviflorum	aa	s	o	—	—
montanum	a	s	—	—	—
palustre	a	s	o	—	—

Circæa					
lutetiana	a	—	—	—	—
Bryonia					
dioica	a	—	—	—	—
Spergula					
arvensis	a	s	o	—	—
Scleranthus					
annuus	a	s	o	n	—
Sedum					
Fabaria	a	—	—	—	—
reflexum	a	—	—	—	—
Apium					
graveolens	a	—	—	—	—
Helosciadium					
nodiflorum	a	s	o	n	—
Sison					
amomum	—	—	(o)	(n)	—
Pimpinella					
saxifraga	aa	ss	oo	n	d
Sium					
angustifolium	a	s	o	—	—
Æthusa					
cynapium	aa	ss	oo	n	—
Silaus					
pratensis	a	—	—	n	—
Angelica					
sylvestris	aa	ss	o	n	d
Pastinaca					
sativa	aa	s	o	n	d
Heracleum					
sphondylium	aa	ss	o	n	—
Daucus					
carota	aa	ss	o	n	d
Torilis					
Anthriscus	aa	s	o	n	—
infesta	a	—	—	—	—
Scandix					
pecten	aa	s	o	n	d
Anthriscus					
sylvestris	a	s	o	n	—

Chærophyllum					
temulum	aa	—	o	n	—
Conium					
maculatum	a	—	—	—	—
Hedera					
Helix	—	—	o	n	—
Sambucus					
nigra	a	s	—	—	—
Lonicera					
Periclymenum	a	s	o	—	—
Symphoricarpos					
***racemosus**	a	—	—	—	—
Sherardia					
arvensis	a	s	—	n	—
Asperula					
cynanchica	a	—	—	—	—
Galium					
cruciatum	—	—	o	—	—
Aparine	aa	s	o	n	d
Mollugo	aa	ss	o	—	—
verum	aa	ss	o	n	—
palustre	a	s	o	—	—
Valeriana					
officinalis	a	s	—	—	—
Valerianella					
olitoria	a	—	—	n	—
dentata	a	—	—	—	—
Dipsacus					
sylvestris	a	s	o	—	—
Knautia					
arvensis	aa	ss	oo	n	—
Scabiosa					
succisa	aa	ss	o	n	—
columbaria	a	ss	oo	n	—
Eupatorium					
cannabinum	aa	ss	—	—	—
Erigeron					
acris	a	—	—	—	—
Bellis					
perennis	aa	ss	oo	n	d

Inula					
*Helenium ...	a	—	—	—	—
Conyza	a	—	—	—	—
Pulicaria					
dysenterica...	—	s	o	—	—
Bidens					
cernua	—	s	o	—	—
tripartita	—	s	o	n	—
Achillea					
Millefolium ...	aa	ss	oo	nn	d
ptarmica	a	s	o	—	—
Anthemis					
arvensis.........	a	s	—	n	—
cotula	a	—	—	—	—
Matricaria					
Parthenium ...	a	s	o	—	—
inodora	a	ss	o	n	d
Chrysanthemum					
Leucanthemum	a	s	o	—	—
segetum	—	s	o	—	—
Artemisia					
*Absinthium...	a	—	—	—	—
vulgaris.........	a	ss	o	—	—
Tanacetum					
vulgare	—	s	o	n	—
Filago					
germanica......	—	s	o	(n)	—
Gnaphalium					
uliginosum ...	a	s	o	—	—
sylvaticum ...	a	s	o	(n)	—
Senecio					
vulgaris.........	aa	ss	oo	nn	d
Jacobæa	aa	ss	oo	n	d
aquaticus	aa	s	o	n	d
Carlina					
vulgaris.........	a	—	o	—	—
Arctium					
majus	a	s	o	—	—
nemorosum ...	a	—	s	—	—
intermedium...	a	—	—	—	—

Serratula					
tinctoria	a	s	o	—	—
Centaurea					
nigra	aa	ss	oo	—	—
cyanus	—	—	o	n	—
scabiosa.........	aa	s	o	—	—
Carduus					
nutans	a	s	o	n	—
crispus	aa	ss	o	n	—
lanceolatus ...	aa	ss	o	n	—
arvensis.........	aa	ss	o	—	—
palustris.........	a	s	o	—	—
acaulis	aa	ss	o	—	—
Lapsana					
communis	aa	ss	oo	n	—
Hypochœris					
radicata.........	aa	s	—	—	—
Apargia					
hispida	aa	s	o	—	—
autumnalis ...	aa	ss	oo	n	d
Tragopogon					
minor	—	s	o	—	—
Picris					
hieracioides ...	a	s	o	n	—
Leontodon					
taraxacum......	aa	ss	oo	n	d
Sonchus					
oleraceus	a	s	o	—	—
asper	a	s	o	n	d
arvensis.........	a	s	o	—	—
Crepis					
virens............	aa	ss	oo	n	d
Hieracium					
pilosella	aa	s	o	—	—
vulgatum ...	a	s	o	—	—
Campanula					
glomerata......	aa	s	o	n	—
Trachelium ...	a	s	o	—	—
rotundifolia ...	aa	s	oo	n	—
Calluna					
vulgaris ...	aa	s	o	—	—

Erythræa					
centaurium	a	s	—	—	—
Gentiana					
amarella	a	s	o	—	—
Convolvulus					
arvensis	aa	s	o	—	—
sepium	aa	s	o	—	—
Cuscuta					
trifolii	a	s	o	—	—
Cynoglossum					
officinale	a	s	o	—	—
Borago					
* officinalis	a	s	—	—	—
Lycopsis					
arvensis	—	—	o	n	—
Symphytum					
officinale	aa	s	o	n	—
Echium					
vulgare	—	s	—	—	—
Lithospermum					
arvense	a	s	—	—	—
Myosotis					
palustris	aa	ss	oo	n	—
arvensis	aa	ss	oo	n	—
Solanum					
Dulcamara	aa	s	—	—	—
Atropa					
* Belladonna	a	—	—	—	—
Lycium					
* barbarum	a	—	—	—	—
Verbascum					
Thapsus	a	s	—	—	(d)
nigrum	a	s	—	—	—
Linaria					
cymbalaria	—	—	o	n	—
vulgaris	aa	s	o	n	—
spuria	a	s	—	—	—
Scrophularia					
nodosa	a	s	—	—	—
aquatica	a	s	o	—	—

Melampyrum					
pratense	a	s	—	—	—
Pedicularis					
palustris	a	—	—	—	—
Rhinanthus					
Crista-galli	a	—	—	—	—
Euphrasia					
officinalis	aa	ss	o	—	—
odontites	a	s	o	—	—
Veronica					
Anagallis	aa	s	o	n	—
Beccabunga	aa	s	—	—	—
Chamædrys	a	—	—	n	—
officinalis	—	s	—	—	—
serpyllifolia	—	s	o	n	—
arvensis	a	—	o	n	—
agrestis	a	—	o	n	—
polita	a	—	o	n	d
Buxbaumii	a	s	oo	n	d
hederifolia	—	—	o	n	—
Mentha					
aquatica	aa	s	o	—	—
arvensis	aa	s	—	—	—
pulegium	—	—	o	—	—
Lycopus					
europæus	—	s	o	—	—
Salvia					
verbenaca	a	—	—	—	—
Origanum					
vulgare	a	s	o	—	—
Thymus					
serpyllum	aa	s	o	—	—
Calamintha					
officinalis	a	—	o	—	—
acinos	a	s	—	—	—
clinopodium	aa	s	o	n	—
Scutellaria					
galericulata	a	s	—	—	—
Prunella					
vulgaris	aa	ss	o	n	—

Lamium					
amplexicaule	a	—	o	n	—
purpureum ...	aa	s	oo	n	d
album	aa	ss	oo	n	d
*maculatum ...	a	—	—	n	—
Galeobdolon ...	—	s	—	—	—
Galeopsis					
Ladanum	a	s	o	—	—
Tetrahit	aa	s	o	n	—
Stachys					
Betonica	aa	s	o	—	—
sylvatica	aa	ss	o	n	—
palustris	aa	s	o	—	—
Ballota					
fœtida	a	s	o	(n)	—
Ajuga					
reptans	—	—	o	—	—
Verbena					
officinalis	a	s	—	—	—
Primula					
vulgaris	—	—	—	—	d
veris	—	s	—	—	—
Anagallis					
arvensis	aa	ss	o	n	—
Plantago					
lanceolata	aa	ss	o	n	—
media	aa	s	o	—	—
major	aa	s	o	—	—
Chenopodium					
album	aa	s	o	n	—
Bonus-Henricus	a	s	—	n	—
rubrum	—	s	o	—	—
Atriplex					
angustifolia ...	a	s	—	—	—
deltoidea	a	—	—	—	—
Rumex					
conglomeratus	aa	s	o	—	—
obtusifolius ...	aa	s	o	—	—
crispus	a	s	o	n	—
Hydrolapathum	a	—	—	—	—
sanguineus ...	aa	s	o	—	—

Polygonum					
amphibium ...	a	—	—	—	—
lapathifolium	—	s	—	—	—
Persicaria	aa	s	o	n	—
aviculare	aa	ss	o	n	d
hydropiper ...	a	s	o	n	—
convolvulus ...	aa	s	o	n	—
Euphorbia					
Helioscopia	a	—	o	—	—
amygdaloides	—	s	—	—	—
Peplus	a	s	o	n	—
exigua	a	—	o	—	—
Urtica					
urens	a	s	o	n	d
dioica	aa	s	—	—	—
Humulus					
lupulus	a	s	—	—	—
Spiranthes					
autumnalis ...	—	s	o	—	—
Colchicum					
autumnale ...	a	s	o	—	—
Juncus					
effusus	a	s	o	—	—
glaucus	a	s	o	—	—
acutiflorus ...	a	s	—	—	—
lamprocarpus	a	s	—	—	—
Alisma					
plantago	a	s	—	—	—
Butomus					
umbellatus ...	a	s	—	—	—
Triglochin					
palustre	—	s	—	—	—
Sparganium					
ramosum	a	—	—	—	—
simplex	—	s	—	—	—
Potamogeton					
natans	(a)	—	—	—	—
Eleocharis					
palustris	a	—	—	—	—
Phalaris					
arundinacea ...	a	—	—	—	—

Anthoxanthum					
odoratum	a	s	—	—	—
Phleum					
pratense	a	s	—	—	—
Alopecurus					
geniculatus ...	a	—	—	—	—
agrestis	a	—	—	—	—
Phragmites					
communis	a	s	—	—	—
Agrostis					
vulgaris.........	—	s	—	—	—
alba	a	—	—	—	—
Holcus					
lanatus	aa	ss	o	n	—
Aira					
cæspitosa	a	—	—	—	—
Arrhenatherum					
avenaceum ...	a	s	o	n	—
Poa					
annua	aa	s	oo	n	d
pratensis	a	—	—	—	—
Glyceria					
fluitans	a	s	o	—	—
plicata	a	—	—	—	—
aquatica	a	s	o	—	—
Dactylis					
glomerata	a	s	o	n	—
Festuca					
sciuroides	a	—	—	—	—
gigantea	a	s	o	—	—
pratensis	a	s	—	—	—
arundinacea ...	—	s	—	—	—
Bromus					
erectus	a	s	o	—	—
asper	a	—	—	—	—
sterilis	a	—	—	—	—
Serrafalcus					
mollis	a	s	—	—	—
Brachypodium					
sylvaticum ...	a	—	—	—	—
Triticum					
caninum	a	—	—	—	—
repens	a	—	—	—	—
Hordeum					
murinum	—	s	—	—	—
Lolium					
perenne	aa	s	o	n	—
Rye	—	s	—	—	—
Oat	—	—	—	n	—
Barley	—	—	—	n	—

NEW SPECIES.

[Erysimum cheiranthoides ...	**A specimen found in Mr. Brind's garden, accidentally introduced.]**
Malachium aquaticum	**Lockeridge, J.S.**
Malva moschata	
var. Ramondiana ***Gren and Godr***	**Near Marlborough F.E.T.**
[Oxalis corniculata	**A weed in Mr. Brind's garden, said to have been probably introduced with soil from Bedwyn.]**
Vicia gracilis	**Railway Bank, Marlborough, J. B. Fuller and E. L. Hesketh.**
Lythrum salicaria	**Ramsbury, J.B. Fuller.**
Eplobium palustre	**Axford, J.S.; Martinsell, J.S.**

Circæa lutetiana	The only spot, at present recorded, where this undoubtedly grows wild is the copse above the S. side of Axford, J.S.
Sedum fabaria	West Woods, J.S.
Apium graveolens	Water-meadows, near Elcott Mill.
Sison amomum	Lane at back of the "Ailesbury Arms" on the Bath Road, J.S.
Inula conyza	Axford.
Bidens tripartita	Pond near New Mill, J.S.
Achillea ptarmica	Mildenhall, J.S. ; Martinsell, F.E.T.
Arctium nemorosum	Poulton ; Overton, J.S. ; Wan's Dyke, J.S. & F.E.T.; Axford.
Arctium intermedium ...	Overton, J.S.; West Woods.
Picris hieracioides	Ogbourne Long Copse, J.S.,; S. slope of Martinsell, J.S. ; Manton Copse, J.S. ; Bedwyn, J.S.
Cuscuta trifolii	White Horse Down, J.S. ; Chisbury, J. B. Fuller and H. J. Verrall.
Linaria spuria	Bedwyn, J.S., & F.E.T., Figheldean.
Mentha pulegium	Martinsell, J.S.
Salvia verbenaca	Axford, J.S., "On the way to Ramsbury" was the only locality known. Re-discovered by Rev. J. Sowerby.
Chenopodium album	var. *viride*, Martinsell, J.S.
Chenopodium rubrum	Farm S.E. of Martinsell, J.S. ; between Bedwyn and Pewsey, J.S.
Antriplex augustifolia	Marlborough ; Axford ; Overton, J.S.
Antriplex deltoidea	Overton, J.S.
Polygonum Hydropiper ...	Mildenhall, F.E.T., New Mill, J.S. ; Ramsbury.
Salix viminalis	Omitted in all previous lists. Common.
Salix rubra	Manton.
Salix fusca	Near Martinsell.
Festuca pratensis	College grounds. Mildenhall.
Festuca pratensis var. *loliacea*	Granham Hill ; Mildenhall.
Hordeum murinum	Figheldean.

NEW LOCALITIES, &c.

Ranunculus Flammula	Huish Marsh, J.S.
Ranunculus acris	The sub-species occurring about Marlborough is the Ranunculus vulgatus *Jord.*

Papaver lecoqii	Yatesbury; Mildenhall.
Nasturtium palustre	Pond on the S. of Martinsell, J.S.
Lepidium campestre	West Woods.
Reseda lutea	Overton, J.S.; Axford, J.S.
Reseda luteola	Bedwyn, J.S.
Arenaria leptoclados	Overton, J.S.; Figheldean.
Lychnis Flos-cuculi	Axford, J.S.
Malva rotundifolia	Overton, J.S.; near the College; Pewsey, J.S. New Mill, Rev. G. W. De Lisle.
Hypericum tetrapterum	Lockeridge, J.S.; Axford, J.S.
Hypericum humifusum	Overton, J.S.
Geranium columbinum	Bath Road, J.S.
Ulex nanus	Chisbury, J.S. & G.W.D.L.; Shaw's Farm, J.S.
Trifolium arvense	Near New Mill, J.S.
Lotus major	Newton, J.S.; West Woods, J.S.; Huish Marsh, J.S.
Vicia hirsuta	New Mill, Rev. G. W. De Lisle.
Agrimonia odorata	West Woods, J.S.
Epilobium montanum	New Mill, Rev. G. W. De Lisle.
Circæa lutetiana	Gardens, Marlborough.
Scleranthus annuus	Huish, J.S.; Long's Penning, J.S.
Silaus pratensis	Mildenhall, J.S.; Axford.
Torilis infesta	Axford; Overton, J.S.
Spergula arvensis	Folly Farm; Pewsey Valley (*passim*).
Valerianella olitoria	Fields at bottom of White Horse Down.
Valerianella dentata	Overton, J.S.
Tragopogon minor	Axford, J.S.; Ramsbury, J.S.
Eupatorium cannabinum	New Mill, J.S.
Erigeron acris	Railway cutting, Savernake, J.S. & F.E.T.
Bidens cernua	Newton, J.S.; New Mill, J.S.
Matricaria Parthenium	Martinsell, J.S.
Artemisia vulgaris	Poulton; Axford, J.S.; Kennett; Down above Preshute, J.S.; New Mill, Rev. G. W. De Lisle.
Tanacetum vulgare	Martinsell, F.E.T.
Gnaphalium sylvaticum	Ivy's Farm, J.S.; New Mill, J.S.; Martinsell, J.S.
Serratula tinctoria	Long's Penning, J.S.
Centaurea cyanus	Canal bank, S. of Martinsell, J.S.
Phyteuma orbiculare	Down near Yatesbury, Rev. A. C. Smith.
Campanula trachelium	Spy Park, West Woods, J.S.; Bedwyn, J.S.; Huish, J.S.

Lycopsis arvensis	Canal bank, Savernake, J.S.
Echium vulgare	Wan's Dyke, F.E.T.
Verbascum nigrum	Overton, J.S.; Clatford.
Origanun vulgare	New Mill, J.S.
Scutellaria galericulata ...	Axford; Mildenhall, F.E.T.
Verbena officinalis	Mildenhall, near the river; Sun Lane, Marlborough, J.S.; Bedwyn, J.S.
Polygonum amphibium ...	Ramsbury.
Butomus umbellatus	Ramsbury.
Juncus acutiflorus	Mildenhall.
Juncus lamprocarpus	Axford.
Sparganium simplex	Ramsbury.
Triticum caninum	Axford.
Triglochin pulustre	Huish Marsh, J.S.

White varieties of the following have been found :

Geranium pratense	Overton, J.S.
Epilobium montanum ...	Wan's Dyke in West Woods, F.E.T.
Centaurea nigra	Lockeridge, J.S.
Centaurea Scabiosa	Axford.
Calluna vulgaris	Shaw's Farm, J. H. Garland.

DONATIONS TO THE MUSEUM.

Archæology.—

Coins by A. W. Banks, R. M. B. Glasse, W. A. Eckersley, Rev. G. W. De Lisle, E. W. Swetenham, G. H. Dawson, Esq., A. P. C. Boevey, C. A. Sladen, J. H. R. Clarke, Mr. Perkins, and Rev. J. W. Mills.

Stone from Pompeii, by E. W. Swetenham.

Curiosities from Italy, by H. W. Simpkinson.

Title-page of a Book belonging to Frances Seymour, by Rev. G. G. Bradley.

Austrian Bank-note, by W. A. Eckersley.

Entomology.—

Pair of *Collix Sparsata*, by Mr. T. Brown, Cambridge.

Lulworth Skipper (*P. Actæon*), by J. H. Garland.

Pendent Wasp's Nest from the Forest, by F. Head.

Silver-washed Fritillary (*A. Paphia*), and other Butterflies, by G. E. Manisty.

Death's Head Hawk-moth (*A. Atropos*), by the President.

3 *A. rubricata*, 1 *E. Ochroleuca*, 1 *S. Sticticalis*, 3 *L. dispar*, *A. citraria*, Rev. J. W. Mills.

Geology and Mineralogy.—

Collections of Fossils, by W. D. Smith, Esq., and L. W. Hinxman.
Collections of Minerals, by C. R. Waldron, E. W. Swetenham, F. H. Thirlwall, Mr. Hawkins.
Asparagus Stone in Foliated Talc, by E. F. im Thurn, Esq.
Amethyst, by C. G. H. Mann.
Ammonite, by H. T. King.
Iron Pyrites, by E. H. Peacock.
Mammalian Remains, by Rev. J. F. Bright.

Ornithology.—

Humming Birds and New Zealand Birds, by C. R. Waldron.
Indian Birds, by T. F. Bourdillon.
Grey Phalarope, *(P. lobatus)*, by S. W. Featherstone.
Pair of Kentish Plovers *(C. Cantianus)*, and pair of Sanderlings, *(C. arenaria)*, by E. F. im Thurn, Esq.
Ostrich's Egg and Oriole's nest, by W. C. Merriman, Esq.

Various.—

Leveret's skull, by H. A. M. Power.
Norwegian bread, 50 years old, by E. W. Swetenham.
Fresh-water Shells from the Nile, Wild Date, and Piece of the Queen's Tomb at Thebes. } by Mr. Baker, Cambridge.
Four Esquimaux Arrows, Indian Brush, Cloak of South Sea Island Chief, 4 play-bills printed on board the "Enterprise," and Saw of Saw-fish. } by Mr. Phelps.
Human hand (mummified) from Arica, in Peru, by W. Fergus, Esq., M.D.
Sun-fish, by Sergeant Adams.
Painting on Talc, by A. C. Hilton.
Revinque (or Spanish Whip) and Bolas, from South America, by W. J. Smythies, Esq.
Iron pipe filled with Carbonate of Lime, by the Bursar.
Two Pairs of Horns of the Klipspringer, by W. C. Merriman, Esq.
Wildman's "Bees," by Mr. Turner.
Esquimaux Carvings.
Fibre of Aloe from Jerusalem } Rev. J. W. Mills.
Piece of Oak from Mamre.
Collection of Shells, by Rev. T. W. Dowding.

LIST OF DONATIONS TO THE FUNDS OF THE SOCIETY.

	£	s.	d.
C. Hodgson, Esq.,...	1	0	0
A. Armstrong, Esq.	0	2	6
F. J. H. Jenkinson	0	2	0
G. H. Dawson, Esq.	0	5	0
Rev. E. H. Fisher	1	1	0
A. H. Beesly, Esq.	0	11	0
E. F. im Thurn, Esq.	0	7	6
	£3	9	0

REPORTS FOR MIDSUMMER, 1869.

No. printed	450
Sold	361
Given away	79
No. in hand	10
	450

ACCOUNTS.

Receipts.

	£	s.	d.
Balance in hand	3	15	8
Subscription from Honorary Members	2	12	6
Ditto from Members ...	3	11	0
Arrears	0	6	0
Donations	3	9	0
Sale of back Reports ...	0	5	6
„ Reports for Midsummer 1869 ...	40	12	3
2 Compositions...	2	2	0
	£56	13	11

Expenditure.

	£	s.	d.
Plates to illustrate Report	3	1	3
Printing Report	25	0	0
Cabinet for Museum ...	8	15	0
Wilts Archæological Magazine	8	8	0
Entrance fee and subscription to Wilts Archæological Society	1	1	0
Aubrey's Wiltshire	1	5	3
Field day	1	16	0
Birds and stuffing	0	12	8
Zoologist and Geological Magazine	0	11	3
Carriage of fossils, &c. ...	0	3	11
Stationery...	0	6	6
Sundries	0	4	6
Balance in hand	5	8	7
	£56	13	11

G. E. MANISTY. }
W. D. FENNING. } **Auditors.**

LIBRARY.

ARCHÆOLOGY.

Humphrey's Coin Collector's Manual...	G. G. Monck, Esq.
Madden's Hand-book to Roman Coins	W. D. Fenning.
Aubrey and Jackson's History of Wilts	

BOTANY.

Flora of Marlborough ...	Rev. T. A. Preston.
Sowerby's British Wild Flowers	
Synopsis Floræ Helveticæ	Rev. H. Baber.
Flora Germanica	Rev. H. Baber.
Synopsis of British Sea Weeds	Mrs. Gray.
Linnæus Systema Naturæ	Rev. H. E. Booth.
British Ferns (Plues) ...	A. C. Almack, Esq.
British Ferns (Moore) ...	Mrs. Gray.
List of plants within 4 miles of Rugby Close	F. C. Kitchener, Esq.

ENTOMOLOGY.

The Entomologist	Rev. T. A. Preston.
Index Entomologicus	
Entomologist's Monthly Magazine ...	Rev. T. A. Preston.
Introduction to Entomology (Kirby and Spence)	W. W. Fowler, Esq.
British Beetles (Rye)	A. C. Almack, Esq.
British Bees (Shuckard)	W. W. Dayman, Esq.
British Butterflies and Moths (Stainton)	Rev. J. W. Mills.
British Spiders	H. A. Evans, Esq.
The Insect World (Figuier) ...	Rev. G. W. de Lisle.
Lepidopterist's Guide (Knaggs)	Rev. T. A. Preston.
Wildman on Bees	Mr. H. Turner.
Manual of Butterflies and Moths (Stainton)	Rev. H. Bell.

GEOLOGY.

The Geologist	
Geological Magazine ...	Rev. T. Cornthwaite.
Handbook of Geological Terms (Page)	
A Paper on the oldest known British Crab ...	H. Woodward, Esq. F.G.S.
Geology for the Million (Wood)	H. S. Strickland.
On the Structure of Xiphosura	H. Woodward, Esq F.G.S.
Antiquity of Man (Lyell)	
British Fossil Mammals and Birds (Owen)	
Geological Observer (De la Beche)	Mr. Neate.

Primeval Man (Duke of Argyle)	W. W. Fowler, Esq.
Mineralogy (Dana)	J. B. Gilmore, Esq.
British Fossils (Morris)	Rev. T. A. Preston.

ORNITHOLOGY.

British Birds (Montagu)	Rev. T. A. Preston.
The Feathered Tribes (Cassell)	A. Herklots, Esq.
The Ibis	Rev. T. A. Preston.
Eggs of British Birds (Hewitson)	
Ootheca Woolleiana (Part 1)	Professor Newton.
Birds of Bucks and Berks (Kennedy)	H. R. H. Prince Leopold.
Ditto	Rev. R. Duckworth.
Birds of Somersetshire (Smith)	Rev. T. A. Preston.

MISCELLANEOUS.

Recreative Science	Rev. J. M. Fuller.
Popular Science Review	Rev. J. M. Fuller.
The Student	Rev. J. M. Fuller.
Intellectual Observer	Rev. J. M. Fuller.
Zoologist	
Conversations on Chemistry	H. M. Moule, Esq.
Wells on "Dew"	H. M. Moule, Esq.
"That's It" or "Plain Teaching"	F. C. Lightfoot, Esq.
Homes without Hands (Wood)	
Plants and Animals under Domestication (Darwin)	Miss E. Corrie.
Naturalist on the Amazons (Bates)	G. H. Dawson, Esq.
British Fishes (Yarrell).	
British Reptiles (Bell).	
Pictorial Museum of Animated Nature.	
Wilts Archæological and Natural History Magazine.	
Natural History of Selborne (White).	F. Madan.
Memoir of J. Wolley	Professor Newton.
Various Papers on Natural History Subjects	Rev. A. C. Smith.
Report of the Rugby School N.H.S.	The Society.
„ the Harrow Scientific Society	The Society.
„ Wellington College N.H.S	The Society.
„ Clifton College N.H.S.	The Society.
„ High Wycombe, N.H.S.	The Society.
„ M.C.N.H.S.	
Eyes and No Eyes	Rev. T. A. Preston.

NATURAL HISTORY PRIZES.

THE Natural History Society proposes offering Prizes Half-Yearly for the best Essay on any particular portion of any one of the following subjects—viz., Ornithology, Entomology, Geology, and Botany.

The objects of these Essays being to call forth *facts* deduced from personal observation, the prizes will be adjudged not so much for the style in which they are written, as for the facts which they mention. *Hence every fact stated must be the result of personal observation.* This does not preclude reference to books; on the contrary, opinions or observations of others may be properly alluded to, but these must be mentioned only in connexion with the actual observation of the writer.

As a guide to what would be required, the following remarks may be useful:—

Ornithology.—The paper may be confined to observations on a single bird, or group of birds, the arrangement and colour of the feathers, the nesting, singing, migration, and habits, the amount of good or harm done to crops and fruit-trees by destroying insects, &c. Also any remarks upon instinct may be included.

Entomology.—The life-history of a single insect may be taken—the commoner the better—*e.g.*, that of the common white butterfly: and some account may be given of its external and internal structure, its ravages, the best methods of destroying it, its times of appearance, enemies, &c.

Or any particular plant may be selected, and an account of any of its insect ravagers may form the subject of the essay. The oak among trees, the nettle among common plants, will each supply a very extensive field of observation.

Geology.—Observations on any particular district or stratum—or characteristic fossils.

Botany.—Observations on any particular plant, its structure, times of flowering, uses, and products; how affected by light, heat, &c. Or the Flora of any particular district.

Or observations on Forest Trees, how affected by pruning or crowding. Savernake Forest would form a good field for study in this line.

The number of subjects therefore is very great, and each candidate can suit his own particular taste. As the essays must be the result of personal observation, no fact, however trivial, need be thought superfluous, and each candidate is expected to write his essay as if no information had ever been given on the subject. The Essays to be sent in on June 1st, and December 1st, in each year.

C. PERKINS, PRINTER, TIMES OFFICE, MARLBOROUGH.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1870.

◆

"TUM MIHI NATURÆ LIBEAT PERDISCERE MORES
QUIS DEUS HANC MUNDI TEMPERET ARTE DOMUM."

◆

MARLBOROUGH.
PRINTED BY C. PERKINS, TIMES OFFICE.
1870.

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PREFACE.

The Society has now entered on the seventh year of its existence, and it becomes a matter of interest to see how far such Societies as ours have any real and lasting vitality. Those acquainted with University life are aware how many similar Societies terminate with the departure of their founders, and surely the Marlborough College Natural History Society must depend in a very great measure for its existence upon the exertions of those who, after a few years spent here, will leave for other scenes of action, and hand over the continuation of the Society to other and newer hands. So far, the Committee venture to think, the vitality of the Society has stood the test, though it is a matter of regret that the want of energy in the mass, alluded to in our last Reports, has not in any way been lessened. Still there are active members, and if they will only continue their exertions and bring others to such a pitch of activity that when they themselves leave, their places may be properly supplied, the Society need not fear for its existence. The Records of work done speak for themselves, and the Society may very fairly congratulate itself on having done *something*, little though it may be, to justify its existence.

The past Half-year has been a memorable one in many points. First must be mentioned the publication of the "Birds of Marlborough," by an old member of the Society, E. F. im. Thurn, Esq. The work itself is intended for the use of the members of the School, and being written by one who really worked, when here, at Ornithology, it is put into such a shape as to be as useful to them as possible. In addition to giving such local information about the different species, as the author was able to collect, it gives a summary of all observations made by members of the School, as far as they have been preserved, and the work forms, therefore, a good nucleus for the accumulation of future records. Various circumstances prevented the sale of the book being as extensive as was anticipated, and the Committee, who naturally take an interest in a book written by a former member of the Society, in which he particularly acknowledges the benefits he has derived from it, venture to hope that members of the School will aid in preventing the book being a dead loss to the author. The Reviews of the book have been very favourable, all agreeing that it is just what it pretends to be. One remark has been made, viz., that the number of species enumerated is far fewer than can be the case, but though a few new species have been added to the list, no authenticated instance of the occurrence of any bird in the neighbourhood, of which the author could get information, has been omitted.

The circumstances which caused the departure of the School at a very important season for observations, have caused a serious interference in that part of our Report, but, on the other hand, the presence of the school here during July, has not been without its counteracting benefits. Many new species have been added to the lists, and our calendars will therefore be of their usual length.

Among the papers printed in the Report must be mentioned the one on "Bird Life." It has been written by Mr. Penrose, who, though not connected with the College in any way, kindly contributed this paper, one which is a perfect model of what such papers should be, and is certainly as important as any one which has ever appeared in our Reports. Of other papers printed, the majority are naturally by those who are not members of the School, but all will be found of interest to some, at least, of those who may like to read them.

The number of Honorary Members who have compounded is on the increase, and a consequent simplification of accounts is the result. The money derived from this source, as well as any balance in hand, is now deposited in the Bank, where it will accumulate till required for the furnishing of a new Museum, a thing much wanted, but as yet only among those things we *hope* to get at some future time. The amount of the half-yearly contribution is very small, and as a Report is given in return, the profits of the Society upon each Honorary Member amount to but a few pence; writing to apply for payment of subscription and postage of the Report diminish this profit still more, and the committee have consequently determined that no Reports shall in future be sent to Honorary Members whose subscriptions are in arrear. If, therefore, Honorary Members would kindly forward their subscription on receipt of the regular Report (when the subscription really falls due) much trouble and expense would be spared to the Society.

The Committee are sorry to say that the number of new members is not equal to those who have left the Society; no doubt the unsettled Half-year is a cause of this, which may be corrected by subsequent Half-years. On the other hand the greater interest shown in the welfare of the Society by Masters is a good sign of stability, for the Society will necessarily derive its greatest strength from those who are permanently resident here.

Prizes were offered for the best essays on observed facts. The Committee regret that no member of the Society or of the School has felt disposed to try for them.

There was one Field-day during the Half, which was unusually successful, but an attempt at a second failed, owing to the unwillingness of a fair proportion of members to take part in it.

The Committee wish to conclude by expressing their warm thanks to all Donors and others who have in any way shown an interest in the Society. A detailed List of Donations will be found in the Report, but the Committee cannot refrain from especially noticing that from Mr. Gauntlett, the Head Keeper of Savernake Forest, of male specimens of the gold and silver Pheasant.

LIST OF MEMBERS.

PRESIDENT:
Rev. T. A. Preston.

SECRETARY:
W. D. Fenning.

TREASURER:
Rev. T. A. Preston.

LIBRARIAN:
E. Almack.

COMMITTEE:
The Ex-Officio Members.
C. M. Bull, Esq.
E. Almack.
J. B. Fuller.

HONORARY MEMBERS:
Rev. G. G. Bradley.
A. Armstrong, Esq.
H. M. Moule, Esq.
F. E. Thompson, Esq.
W. E. Mullins, Esq.
C. M. Bull, Esq.
Rev. J. F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq.
F. Storr, Esq.
W. H. Macdonald, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. R. Dumergue, Esq.
R. W. Tayler, Esq.
W. Mansell, Esq.
Rev. G. W. De Lisle.
R. F. Isaacson, Esq.
F. Giles, Esq.
W. W. Dayman, Esq.
H. A. Evans, Esq.
Rev. J. W. Mills.
E. C. Sewell, Esq.
J. Walker, Esq., M.D.
A. C. Hilton, Esq.
D. E. Leighton, Esq.
W. W. Fowler, Esq.
M. H. Smith, Esq.
J. F. Cornish, Esq.
C. Sankey, Esq.
A. H. Beesly, Esq.
F. E. Hulme, Esq., F.L.S.

MEMBERS:
E. Almack.
J. B. Oakeley.
***J. B. Fuller.**
C. A. Sladen.
E. L. Hesketh.
B. J. Guillemard.
H. S. Sankey.
***W. D. Fenning.**
***H. J. Verrall.**
P. L. Hesketh.
E. H. Wyatt.
H. R. Armstong.
H. C. Spry.
J. H. R. Clark.
G. C. Mansel.
T. C. Owen.
E. A. Champneys.
E. Meyrick.
G. H. Perry.
F. Madan.
A. S. Marshall Hall.
S. C. V. Filleul.
W. J. Gardner.
H. O. Yeatman.

*** Heads of Sections.**

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members and Honorary Members.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by members of the Society.

Management.

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Committee.

7.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in editing the Report.

Secretary.

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee appointed by the President.

Treasurer.

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

Librarian.

14.—That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Report of the Society.

Library.

15.—That any member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

19.—That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purpose of study, provided there be a reasonable excuse for their not belonging to a Section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

Members.

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1s. on election.

25.—That Members have the right to be present, to state their opinions, and a vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

Visitors.

26.—That on such occasion when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

Honorary Members.

27.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

Suspension of Members.

28.—That any member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

29.—That Sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these Sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these Sections shall hold meetings as often as shall seem fit to the Heads of the several Sections, at which any member of the School, with the sanction of the Head of that Section, may attend.

Meetings.

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD FEBRUARY 18TH, 1870.

THE following donations were announced, and thanks ordered to be given to the donors:

"Kimmeridge Money," by Rev. J. S. Thomas. The following note was received from the Rev. J. H. Bond, of Creeck Grange, Wareham, who gave them to Mr. Thomas:

> "The subject of the Coal Money has exercised the imagination of a variety of persons who have discussed its possible use, and by what people.
>
> It is made from a bituminous shale or schiste, which is found around this coast. The money (as it is called) is found in considerable quantities in different localities, some of them some miles from the coast, buried in confused heaps generally, about a foot or two below the surface of the soil. It has been doubted by some whether the remains are not Phœnician, though the original idea that it was money, has been generally rejected. The last and probably the best paper respecting coal money, was written by the Rev. J. H. Austen, and printed for private circulation amongst the papers of the Purbeck Society. His idea is that it forms the refuse of the Armillæ, or Bracelets, which were turned of this material, and which latter were frequently worn by the early Britons. There are occasionally broken pieces of these rings found with the Coal Money.
>
> I remain, faithfully yours,
>
> J. H. BOND."

Spoon from the South Sea Islands, by E. W. Swetenham.

Two Love-bird's Eggs, from Australia, by F. Leigh.

Slag from an old Roman iron furnace in S. Wales, by H. A. M. Power.

Stag's Horn from below the foundations of Caerphilly Castle, Cast of a Trilobite, and Fossils from Watchet, in Somersetshire, by C. R. Waldron.

Collection of Bird's Eggs, remarkable for form or markings, by E. C. Sewell, Esq.

Guillemot's Eggs and Specimens of Tin and Copper, by F. H. Thirlwall.

Coins by G. H. Perry, H. W. Simpkinson, and C. E. Down.
Specimens of Indian Paper, by H. C. Spry.
Egyptian Pipe, by H. S. Sankey.
G. H. Perry exhibited some Ammonites, and
J. H. R. Clark, a Chinese Padlock.

A. C. Champneys read the following Paper on

FISH.

Fish are the lowest of Vertebrate animals.

The blood-corpuscles are red, as in all Vertebrata, but they are nucleated, a structure which is not found in the highest Vertebrate animals.

The heart has two chambers, an auricle and ventricle. This is the case in all fish except the *Amphioxus*, which has no proper heart, and the *Lepidosiren* or Mud-fish, which has two auricles, but it is doubtful whether this last should be classed among fish or among the *Batrachians* (Frogs, Newts, etc.)

The respiration of fishes is carried on by gills, which are usually a number of plates (fitted on to bony or cartilaginous arches), through which numbers of blood vessels run, and the blood is thus brought into contact with the air suspended in the water and purified. These gills are fitted with gill-covers, which allow the water to pass off from the gills; they are usually situated on each side of the neck.

The mouth only is used in respiration, the nostrils having no internal opening.

Fish usually lie with their mouths up stream, so that the water may pass over their gills more easily. Fish can be drowned by holding their heads down stream, this prevents the water passing over their gills through the mouth.

The mouth generally contains a great number of small teeth, but in the *Cyprinidæ* or Carps (the Carp, Tench, Roach, etc,), the bones of the throat support very powerful teeth which work against a process of the skull.

In the digestive apparatus there is nothing very remarkable except that there is a striking advance in some of the organs in the higher types of fish over the lower. Thus the *Pancreas* (an organ for supplying juices to the stomach), in the lower types has its place supplied by a number of cœcal appendages, but in the higher types of fish, the Cartilaginous, as Sharks and Rays, there is a single organ resembling the Pancreas of the higher animals very closely. In those fish which swallow their prey alive, as the Pike, the teeth are inclined backwards, so that the prey easily slips forward into the stomach, but cannot go back out of the mouth. In Sharks there are a number of flaps of flesh hanging down in the gullet which perform a similar office. Most fish possess an air bladder which assists to balance and hold up their bodies in the water. It is sometimes unconnected with the mouth, and then probably obtains its air from the blood, but in some (the *Physostomata*, a class which includes the Herring, Salmon, Pike, Perch, Carp, and many others) it is connected with the mouth by a tube, and in the *Lepidosteus* or Bony Pike, one of the ganoid class of fishes, the air bladder is divided into cells; and in the *Lepidosiren*, which possesses lungs (and is, in fact, the connecting link between fish and *Batrachians*), the air bladder is wanting. For these reasons it is thought that the air-bladder of fish is a rudimentary lung.

In the nervous system of fish there is a great distance between the lower types and the higher. In the lower fish the cerebral hemispheres, the size of which correspond to the intelligence of the animal, are very small, but in the sharks they predominate over the rest of the brain. The nervous system of fish generally is very inferior to that of other vertebrata, and the brain is very small. The lobes of the brain connected with the sense of smell are very large. The ears are internal, but in the shark there is a trace of an external opening.

Fishes are divided into orders, the *Leptocardia*, the *Cyclostomata*, the *Teleostea*, the *Ganoidea*, the *Selachia*, and the *Dipnoi*.

I.—The *Leptocardia*. This order contains only one fish, about 1½ inches long, the *Amphioxus lanceolatus*, which inhabits the sea in places where there is a sandy shore. It is a slender transparent creature, and this allows its organs to be easily traced. Its vertebral column is represented by a gelatinous chord (the *chorda dorsalis*) which supports the axis of the nervous system (the latter in this case is only the spinal chord as far as the *medulla oblongata*). It has no brain. The head bears two eyes, and a small pit furnished with cilia, which appears to be a nostril: the mouth is placed at the front of the head, it possesses no jaws. It opens into a large branchial sac, (a sac in which the *branchiæ* or gills are enclosed), this sac opens into the general cavity of the body, the water is carried off by an opening at the under side of the body. It possesses no heart, but the large vessels contract, and thus act in place of one, and its blood is colourless. It is thus, evidently, the lowest of *vertebrata*, and it was, in fact, doubted by some authors, whether it should be placed among them at all.

II.—The *Cyclostomata*. This order shews a great advance on the preceding one. The skeleton consists of a *chorda dorsalis*, but there is a rudimentary skull; there are no jaws, but the tongue and mouth are often armed with teeth. There are several branchial sacs, which open along the side by separate holes. There is a heart composed of two chambers. These fish are able to attach themselves to stones by their mouth by sucking: amongst others the lampreys belong to this order. There is also a small fish belonging to it, called the *Myxine glutinosa*, or glutinous hag, which eats its way into the bodies of fishes: and is the only vertebrate animal that is a parasite; it was called *glutinosa* from the quantity of mucus it can give off, which is so great that if put into a vessel of water, it will, in a short time, turn the whole into a glutinous mass.

III.—The *Teleostea*. These have a complete bony skeleton, and the skull is composed of numerous bones. The water for respiration passes in at the mouth and out at the gill-covers, which first occur in this order. The limbs are always present, that is, the pectoral fins, which correspond with the fore-limbs of the other vertebrata, and the ventral fins, which correspond, though less closely, with the hind-limbs. The other fins have nothing to correspond with them in the other vertebrata, and are not joined to the vertebral column in the same manner. This order contains several divisions, which are again sub-divided into families. I shall only speak of a few remarkable individuals of this order, as it would take too long, and be very uninteresting to touch on all these divisions. The first I shall speak of is the *Gymnotus electricus*, or electrical eel. This fish, which is about five or six feet long, is able to give an electric shock to anything it touches, strong enough to knock down a man and deprive him of the use of a limb for some hours, and magnetise steel needles. The apparatus extends along the greater part of the body. It is composed of four bundles running parallel to the vertebral column, one on each side of the upper and one on each side of the under part of the body. These bundles are composed of a number of horizontal parallel plates intersected by transverse vertical plates, and the quadrangular canals thus formed are filled with a gelatinous matter, the whole apparatus being furnished with a great number of nerves. The former part of the apparatus is positive and the hinder negative. It is said to be able to benumb small fishes at some distance from it in the water.

Dallas gives the following account of the way in which the Indians capture them. " The Indians of South America, when they wish to capture this fish, commence their operations by driving a number of horses and mules into the ponds inhabited by them: the eels, alarmed at the disturbance, immediately attack the intruders upon their quiet domain, usually applying their entire length to the bellies of the unfortunate quadrupeds, and thus giving the full effect of the whole electrical apparatus. Some of these horses soon become disabled, and, falling down in the water, are drowned; the others, being driven back by the shouts and whips of the Indians, continue the conflict until the powers of the *gymnoti* are, for the time, exhausted. They then endeavour in their turn to escape from the scene of warfare, and for this purpose approach the shore where another enemy awaits them: the Indians, armed with harpoons attached to long cords, strike at all that come within reach, and by jerking them rapidly out of the water, so as to keep the cord from getting wet, contrive to secure their booty without receiving any shock."

There is a very singular little fish belonging to the same division, which inhabits the subterranean caves of North America. It is blind, the eyes being covered with an opaque skin or entirely absent, and its young are brought forth alive. It is a curious fact that all the animals which inhabit the inner parts of these caves, where there is no light at all are blind, while those that inhabit the outer parts where there is little light have the eyes very large. Both are thus directly adapted to their circumstances.

The structure of the *Pleuronectidæ* or Flat-fish is very singular. The head is twisted round so that both eyes are on one side, and the abdominal cavity is very small, and situated close to the head, so that the whole body is nothing but an exceedingly compressed disc-like tail. The young of this fish when hatched has its eyes on opposite sides but they afterwards become twisted to the same side. The white colour of the under side is caused, as in all fish, by the absence of light from that part. The upper and under surface of these fish are not the back and belly, but the two sides.

The common stickleback, which belongs to this order, is remarkable for the care it takes of its young, whereas most fish leave them to shift for themselves. This fish belongs to the same suborder as the perch, which includes those fish in which the first dorsal fin is supported on spines usually extending beyond the membranous part of the fin, in which case it is used more or less as a weapon. In the stickleback the membranous part of the fin is absent, and the spines form very powerful weapons. The stickleback also bears two spines one on each side of its under surface about the middle of the body. The male stickleback forms a nest of small fragments of vegetable matter, and in this the female deposits her eggs. The male keeps guard over this, and attacks intruders with great fury, trying to wound them with its ventral spines. It is said that he sometimes even succeeds in ripping up and destroying his opponent. They are at all times most pugnacious little creatures, and I once knew a "fiery" or male stickleback which killed all the other fish in an aquarium. He keeps guard over the nest till the eggs are hatched; and even then he still keeps guard over the young fry, and carries back any incautious straggler from the nest. The common stickleback has bony plates along the side instead of scales. It lives both in fresh and salt water, and abounds to such a degree in the slow streams and fens of

Lincolnshire, that it is occasionally employed as manure. The fifteen-spined stickleback, a marine species, also builds a nest.

There is a fish inhabiting the Chinese seas, whose mouth is prolonged into a kind of beak, but this is so inclosed by the skin that only a small opening is left for the mouth; this fish is in the habit of shooting a drop of water from its mouth at any insect it sees flying within reach, this nearly always brings the insect down into the water, when it can of course pick it off at its lesuire. The Chinese keep these fish in basins, and amuse themselves by watching them trying to bring down a fly suspended over them by a thread.

The pilot-fish often attends the shark, and it has often been seen, when a bait has been let down from the side of a ship, to go up to it and taste it, and return to the shark, apparently to inform him that it was eatable, as he then took it. A shark was once seen, when about to swallow a bait, prevented from doing so by one or other of four pilot-fish which accompanied him, and when he had taken it and was being hauled out of the water, one of his little friends clung to his side for some time.

The climbing perch, *Anabas scandens*, found in India, often quits the ponds or streams it inhabits, and moves overland to a considerable distance. It has a sac at the base of the skull provided with numerous folds in which the water is retained so that its gills are kept moist. It can live out of water for as long as six days. It is named from its habit of climbing trees.

The *Hippocampus* or sea-horse is a very singular creature. The body is covered with bony plates instead of scales: it has no caudal fin, and uses its long tail to fasten itself to seaweeds. The bones of the face are prolonged into a kind of snout, while the male is furnished with a pouch at the base of the tail, in which the eggs are hatched, and in which the young fry are sheltered. Mr. Yarrell says that he has been told by fishermen that if the young are shaken out of the pouch into the water close by the boat, they do not swim away, but when the parent fish is held in the water in a favourable position the young again enter its pouch.

IV.—We now come to the fourth order *Ganoidea*. This order has its skin clothed with smooth, bony plates, sometimes distributed over the whole body, sometimes confined to the head; these are covered with a layer of enamel. The skeleton exhibits every degree of ossification, from the cartilaginous character of that of the *Selachia*, to one nearly resembling the bony nature of that of the *Teleostea*. They therefore occupy a position intermediate between the bony and cartilaginous fish.

The *Lepidosteus*, however, in some points approaches the *Batrachia* (or reptiles) very closely. Its air-bladder is divided into cells, and thus bears a great resemblance to lungs. The compound structure of the lower jaw presents a close resemblance to that of reptiles. They are the most ancient kind of fish, but are far less abundant now than they used to be: the sturgeon is one of the few considerable *Ganoid* fish now existing.

V.—The *Selachia*. This order comprises the Sharks and Rays.

These are at once distinguished from those of the previous order by the nature of their skeleton, which is composed of cartilage instead of bone. They are often called cartilaginous fish. The skull, instead of being composed, as in the *Teleostea*, or bony fish, of numerous bones joined by sutures, is composed of a single piece of cartilage. The nature of their skeleton has caused some naturalists to place them among the lower orders of fish, but their general organization is so much more perfect than that of the *Teleostea*, that they are now justly placed among the highest, and above the bony fishes. The gills are different from the ordinary type in fish; they are converted into a number of branchial sacs; which open into the throat by separate slits, and usually have also separate slits to allow the water to pass off. The *pancreas* is in the form of a gland, and the brain shews a great advance of intelligence over the bony fish. Most of them produce living young; some, however, as the dog-fish, produce eggs which are inclosed in horny quadrangular cases. These have slits to allow water to pass to the young fish. When the young is sufficiently developed it makes its escape at the end near which its head is placed. These cases are often thrown up on the beach and are called sea-purses, etc. There is one circumstance in which the fishes of this order greatly resemble the *Batrachia*: the young fish before it is hatched is furnished with external gills like the tadpoles. The upper lobe of the tail is in this family nearly always longer than the lower. Some of these fish are very large, the White Shark grows to 25 or 30 feet, and the Basking Shark to 36 feet: some of the Rays weigh several cwt. There is a record of the capture of a ray, which took six oxen, two horses, and twenty-two men, to land. The common skate is a good specimen of a ray. Of course in the ray the upper and under surfaces are the back and belly, not the two sides as in the sole, etc. One ray, the torpedo, is electrical: the electrical powers of the torpedo were known to the ancients, and used for medical purposes.

VI.—We now come to the last order, the *Dipnoi*, so called because they can breathe either by lungs or gills. We may take the *Lepidosiren paradoxa* as an instance: the body is fish-like in form and covered with scales, having a fin running round the hinder part and four limbs, the first pair attached to the back of the skull. The skeleton is semi-cartilaginous. The gills are attached to three branchial arches, opening into the throat by separate slits, but having only one external opening, situated just behind the head. An opening from the throat leads into a pair of cellular lungs, which are perfectly fitted for respiration. The nostrils open into the mouth. The auricle of the heart is divided into two, but the partition is imperfect. These creatures are found in the hot regions of South America and Africa; and during the dry season they bury themselves in the mud. The South American species, *Lepidosiren paradoxa*, is about two or three feet long: the one inhabiting the Gambia, in Africa, (*Lepidosiren annectens*), is about one foot long, and is said to pass nine months of the year in a torpid state. One of the species has external gills in the perfect state. You thus see the great advance in organization which is made as you go from the lowest to the highest orders: we proceed from fishes which have no brain, to the high organization of the brain of the shark; from fishes which have no limbs, to those whose limbs resemble those of the *Batrachians;* from those whose respiration is effected by a branchial sac, which is merely an expansion of the throat, to those which have true lungs; and lastly, as it is doubtful whether the lower fish are to be classed with the vertebrata at all, so it is doubtful whether the highest should not be classed among the *Batrachians.*

C. Sankey, Esq., and A. H. Beesley, Esq., were elected Honorary Members.

There were 56 persons present—2 Honorary Members, 18 Members, and 36 Visitors.

MEETING HELD MARCH 4TH, 1870.

E. L. Hesketh exhibited the Birds' Eggs presented by E. C. Sewell, Esq.

W. D. Fenning announced the Donation of Coins to the Museum, by Mrs. Merriman, E. Almack, and G. E. Manisty, and exhibited those presented by Mrs. Merriman.

The President exhibited a skin of the Three-toed Sloth, a collection of Breast-bones of Birds, and some Opalised Wood from New Zealand.

F. E. Thompson, Esq., then gave a short account of Deep Sea Dredging.

ON DEEP SEA SOUNDINGS AND DREDGINGS.

The present Paper is merely an abstract of a lecture on Deep Sea Soundings, delivered last January, in London, by Dr. Carpenter, at St. George's Hall.

It was long supposed that no life was possible below 300 fathoms. This belief was based on the inferences of Professor Edward Forbes, of Edinburgh, who first turned his attention to dredging. He explored the ocean to a depth of 230 fathoms, and observing the great diminution of life between 100 and 230 fathoms, he came to the conclusion that it would altogether cease at 300.

The first government to prosecute the task was that of the United States, which sent out Professor Bailey. He brought up from the Atlantic bed portions of "Globigerine mud," as it is called, consisting of the shells of Globigerinæ, one of the lowest forms of life: a species of the genus *Foraminiferum.* Bailey was the first to compare this mud to chalk.

Afterwards, when soundings were taken for the Atlantic cable, Dr. Warwick was sent out by the English government in the *Fox.* He took soundings in the waters of Iceland and Labrador, in parts indicating some the Gulf Stream some an Arctic Current. He brought up several higher forms of life, starfish, and small shrimp-like creatures: proving that more varied life than had been supposed existed at great depths. As starfish never swim in mid-water, but always crawl at the bottom, there was no doubt of their existing at these depths.

The Swedish government next sent out Mr. Saas, inspector of fisheries, to the Lofoden Islands and the Hardanger Fiord. The results were most surprising. He brought up an Encrinite three inches long, resembling the *Apiocrinite*, or Pear-lily of the Oolite period; also a lily resembling the *rhodocrinus* found so far back as the Silurian period. The remarkable point thus proved, was, that forms of life, supposed to have been long extinct, have never ceased to exist; these living *encrinites* though small, being the lineal descendant of the larger and earlier Stone Lilies. This discovery has therefore established what may be termed the Continuity of Geological Life, *i.e.*, the continued existence of types supposed to be extinct. Dr. Carpenter showed specimens of the lilies: they were branched like trees with long thin stems attached to stones. Mr. Saas also brought up a nautiloid similar to a forefather in the Lias. He had dredged with improved machinery, using a bag with an iron mouth, which scraped the bottom with a sweep of about a mile.

Soon after, when the French cable was laid to Algiers, molluscs, corals, and shell-fish, were found at a depth of 1100 fathoms, resembling species in tertiary deposits round the shores of the Mediterranean.

The first of Dr. Carpenter's voyages was in the autumn of 1867, (I believe), the scene of operations being from the north of Scotland to the north of the Bay of Biscay.

At this point before describing results the lecturer entered into one or two preliminary questions. And first he asked what are the conditions affecting animal life at great submarine depths. Pressure had been supposed to be one of the most important. Really, it was one of the least so. It is true that man cannot exist below the surface, at a depth of 120 ft. at the most, the pressure on the chest being too great, and circulation being interfered with. But it is not so with animals in whose bodies air does not exist as air, but only when dissolved in water. Such animals may exist under any amount of pressure: they had been found at a depth of 300 fathoms, where the pressure was nearly four tons to the square inch. The only circumstance really fatal to life was the extreme coldness of the water.

It had been supposed that the pressure would destroy the shape of the animal. Such, however, was a complete mistake. If we take first the case of an animal of the simplest form, a mere round cell filled with fluid: it must be remembered that it would be subject to equal pressure on all sides, and so the form would be preserved—the only difference would be that the creature would be somewhat reduced in size. Take next an animal with a stomach. There would be an effort made on its part to lift up the water in order to take in the food. This, it might be thought, would disturb the evenness of pressure, and derange the shape; but the food is forced into the stomach thus emptied at precisely the same rate of pressure as that required to expand the body: the balance will thus be kept and the animal's form preserved. Their conditions, indeed, are precisely the same as when we ourselves breathe in air and drink water; these substances will be driven in at the rate of 15lb. to the square inch, that is to say at the same rate of pressure exerted by the air in our bodies.

It is probable, indeed, that animals become inured to greater pressure as the sea bottom gradually sinks. A parallel instance is recorded by Sir Chas. Lyell with regard to some greyhounds taken to Mexico. The first importation soon became exhausted in coursing hares at great heights, but their progeny became habituated to the effort.

There is, however, one condition which leads to a marked reduction in the variety of species at the surface and at great depths. It is that of vegetation. Vegetation probably ceases altogether at 200ft., there not being sufficient light for its growth. Consequently below that depth there are no animals which feed on plants.

This leads to the question, on what food do animals exist at great depths?

The Crustaceans and starfish doubtless live on the globigerine mud. Now and then their stomachs have been found full of it.

But on what do the *Globigerinæ* live? Between Scotland and the Faroe Islands there are two zones of temperature at the sea bottom, a warm zone of 45°, and a cold one below 30°. During the voyage of 1868 little animal life was found in the cold belt: but in 1869 an improved mode was found for sweeping the submarine ground with tangles of fresh hemp covered with tar. They came up loaded with tons of animal life, while the dredge was hauled up empty. It was then found that the cold bottom was as rich in life as the warm: but not the same life. The *Globigerinæ* were replaced by sponges of an entirely new order. These sponges, however, were essentially similar to the Globigerinæ: both approaching the simplest and lowest condition of organized life, in other words being little removed from what is called protoplasm.

Now it was long known to chemists that salt water contained a large amount of protoplasmic, organic, or animal matter. It was however believed to exist only near shores, and was regarded as a diluted sewage. In 1869, however, Dr. Carpenter partly analysed salt water taken at all depths and all distances from land. The result showed that all sea water contains nearly an uniform amount of this animal matter. Just therefore as the foraminiferæ secrete lime and silex, so, probably, do these sponges and lowest creatures absorb the ocean protoplasm.

A further question of course remains, What is the source of this animal matter thus equally diffused? The ocean, it must be remembered, is teeming with life, animal and vegetable, and no single animal but exudes a slime. This animal matter becomes diffused through the sea, while the low temperature and deficiency of oxygen below retard its decomposition.

But it has been found that oxygen abounds in surface waters, carbonic acid at great depths, and it may be asked how life below is possible under such conditions. In the first place the excess of carbonic acid gas below is due to the respiration of animals. In the second place, by a well-known chemical law, all gases tend to mix with each other,—the oxygen descending and carbonic acid ascending,—so that life is thus rendered possible.

The lecturer proceeded to speak of and exhibited some specimens of creatures brought up from these astounding depths. First he showed a most beautiful sponge of flint which was fished up from the warm area, near the Manillas. It was like an inverted pear with a cup-like mouth covered with hair, below was a filamentous root descending into globigerine mud for two or three feet; this had been named "Venus' Flower Basket." Next was a sponge from Japan, with a body like a spindle, and a long filament like glass. After this he shewed some microscopic jelly-bodied creatures of all shapes, star-like, circular, and cylindrical, which selected grains of sand and other materials of different shapes and hues, and arranged them for their outer covering with the most exact and artistic precision. One substance was chosen for the limbs, quite a different substance, consisting of sponge spicules for the lining of the mouth; in the same way with the colours, here and there it had painted itself with gorgeous quartz sand grains arranged in patterns, which for design and brilliancy would have put to shame Solomon in all his glory.

In conclusion the lecturer emphasized the two geological inferences which his discoveries had led to. First, that mentioned above, of the continuity of geological types; secondly the continuity of geological deposits. The evidence shewed, in his opinion, that the Cretaceous formation had never ceased for an hour, but had been going on from its first formation, and was still forming on the Atlantic bed.

After this the President read the first chapter of a Paper on "Bird Life," written for the Society by the Rev. J. Penrose, which appears in another part of the Report.

E. T. P. Cambridge was deprived of membership for non-payment of subscriptions. F. Madan and A. F. Marshall Hall were elected members.

There were 45 persons present: 5 Hon. Members, 21 Members, and 19 Visitors.

MEETING HELD MARCH 11TH, 1870.

THIS was an extraordinary meeting, that the Society might avail themselves of the kind offer of Mr. Whittall, who delivered a lecture on Phrenology.

There were 77 persons present: 1 Hon. Member, 21 Members, 3 Medii Socii, 52 Visitors.

MEETING HELD MARCH 18TH, 1870.

Geology.—G. E. Manisty exhibited some Coral Limestone, and H. J. Verrall some Lignite (presented by H. P. Dixon, Esq.), Fossils from Coal (presented by Mr. Phelps), a Geological Map of Marlborough (presented by G. E. Frere, Esq., F.R.S.) and a very fine Belemnite (presented by H. C. Tillard).

Archæology.—W. D. Fenning exhibited the coins presented by E. Almack and E. M. R. Edgell, and A. C. Champneys an old Edition of Horace.

Ornithology.—E. L. Hesketh exhibited some Tawny Owl's eggs, laid about March 1st; a variety of the Quail, (*Coturnix Vulgaris*), presented by E. F. im Thurn, Esq., and a specimen of the Little Gull (*Larus minutus*), picked up on Rockley Downs.

Entomology.—H. Manders read a list of Notices, and F. J. H. Jenkinson exhibited a specimen of the very rare Crimson-Speckled Footman (*D. pulchella*), taken last year near Reading.

Botany.—The President read a list of Notices, a very small one for this time of year.

The President then read chapters 2 and 3 of the paper on "Bird Life."

There were 27 persons present, including the Master, viz.: 2 Honorary Members, 13 Members and 12 Visitors.

[*] BIRD LIFE.

CHAPTER 1.—THE DAILY LIFE.

There is no animal *in rerum naturâ* which knows better how to make a good use of its time than birds do. For them the longest day is scarcely long enough, and the shortest night is altogether too long. To give up half their life-time to sleep is a thing which they cannot understand. They must be cheerful and merry as long as they possibly can.

Therefore all birds wake early from their nightly sleep. Scarce does the dawn of a midsummer day glimmer like a shining stripe in the East, when they raise their voices one after the other, and when the morning sun first gilds the tops of the trees, the woods and meadows have already resounded with their united choir. The first sign of Nature's awakening is the note of the cuckoo in the forest, but presently the song-thrush and the redbreast join in with their liquid melodies, the goldfinch and chaffinch strike in with their full song from the young spruce-firs, the black-cock's spring call rings out from the bare hill-sides, and the golden-crested wren's weak but pleasing strophe, the titmouse's cheerful decoy-note, and the tree creeper's pipe soon sounds from nearly every tree, whilst the chiff-chaff and the willow warbler indefatigably renew their monotonous note far and near. In the more open ground the cuckoo is also the first to make his voice heard, soon after begins the lark's full song to sound through the open air, the fly catchers and swallows welcome the day with their lively twitter to the best of their powers, while the redstart, the most unwearied of all our songsters, who has not ceased till just before midnight to sing his song, which was heard the live long day from the leafy tree tops, the whinchat, the wheatear, all these and more have long ago made known the gladness of their lives, when the sun shows himself above the horizon.

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[*] Translated, with scarcely any alteration, from some papers by Herr Robert Collett, Christiania, which seems to be a translation into Norwegian, and an adaptation to Norwegian ornithology, of "Das Leben d. Vogel," by the German ornithologist Brehm.

All sing their morning song fasting, and go forth in search of food first after the sun has risen. The swallows skim backwards and forwards over the meadows, thrushes, finches, larks, starlings and pigeons descend upon the fields, the fly-catchers and warblers look about them among the foliage, woodpeckers, titmice, golden-crested wrens and creepers hop and climb from bough to bough, in a word they all in the fields, in the forest, in the bushes and by the brook side, seek their daily bread.

Most of our birds seize their food with the bill, and the raptorial birds alone use their talons. The woodpeckers spit the insects which they discover in the crevices of the trees on their pointed tongues, and in this manner thrust them down into their gullets, the wryneck sticks his long snakelike tongue into the anthills, and does not draw it back till it is well covered with ants. The birds that have a wide gullet let large morsels or whole living creatures slip down bodily; in this way cormorants and gulls swallow fish a foot long, the eagle and eagle-owl large bones, and the night-jar the largest beetles and night-moths. Some of the longest beaked Waders, such as herons, toss their captures into the air, and catch them in their open mouths.

Birds of prey and some others throw up the undigested parts of their food, as hair and feathers, in the shape of round pellets. But this is not done without considerable effort; an owl on the point of doing this presents a sorry sight, as he turns and twists his head in every direction, moves his wings and legs convulsively, and gives manifest proofs that his situation is by no means a pleasant one.

Some birds keep what is over after a meal till a later opportunity, or lay up storehouses for winter. This last is the case with nutcrackers and nuthatches, both of which collect great quantities of nuts for winter use, whilst the great grey and the red-breasted shrike spit insects and other food on the thorns of various trees, to be able to consume them when the weather is bad and game hard to get.

All the birds that live on carrion, fish and vegetable diet require a great deal of water, insect eaters drink less, and birds of prey often none at all for a long time. Swallows and some sea fowl drink as they fly, and sea-fowl salt water as readily as fresh. All birds drink as we see our tame poultry do, namely by taking a drop in their beaks and raising the head so that the water may run down the gullet.

As soon as the bird has got enough food and drink, away he flies to a safe place, and sets himself to rights, in order that the business of digestion may proceed properly. During this he subsides into a state of quiet enjoyment, and some are so occupied with themselves and their digestion that they even forget their own security. Thus some voracious birds of prey, when they are thoroughly gorged, let the shooter come quite close to them, or almost allow themselves to be seized by the hand. In fact every bird, when gorged, loses its activity and liveliness more or less, and this is the cause of the stillness which at midday prevails in the forest.

In the afternoon this doze is over, hunger demands its rights again, and the bird must once more think about victuals. Whilst the insect eaters feast as long as the sun is in the sky, many seed eaters are contented with two principal meals, and most birds of prey find one enough provided that they have had a sufficiency.

The life of birds is a true reflex of the sky. If the sky is clear, the bird is merry, but if the weather is unsettled, the bird also is out of spirits. On rainy and cold days the search for food takes up all his time, and then his song is silent, but if the weather is thoroughly bad then the bird gives up seeking food altogether. No bird besides the swallow, the pigeon, and most water fowl turn out in rain as readily as in dry weather.

Besides digestion the bird goes through another important business during the middle of the day. Most birds are clean creatures, and only the Woodpeckers, which smear themselves with gum, tree-creepers which stain themselves gray on the wet stems of trees, and the golden-crested wren, which in rainy weather becomes quite black from a species of lichen which grows on the spruce firs in the northern forests, make sometimes, but for only a short time, an exception.

But this cleansing takes a great deal of trouble, and in fact not many minutes pass without the bird trimming itself. For this purpose it often makes use of either a dry or a wet bath.

The dry bath, which we see our tame poultry and the common sparrow use every day, is a powerful means of getting rid of all manner of parasitical animals. The water bath is taken in various ways, some sprinkle their feathers quite lightly, while others wet themselves thoroughly, so that they can scarcely fly. This is particularly the case with the finches and thrushes. All land-birds bathe by wading into a shallow place, and produce a dense shower by strokes of their wings; the water fowl wash themselves in the water itself. Bathing is a necessity for almost all birds, and they sicken and die if they go without it.

After bathing the bird trims and dries his feathers carefully, and after they are set in order they are oiled, in order to withstand wet, with the fatty secretion contained in the gland on the rump. The bird presses out with his beak a drop of this oil and by means if its extremely flexible neck it anoints the feathers of the whole body, except those of the head ; these are at last so well rubbed against the breast and wings, which are already anointed, that they soon receive the necessary quantity of the oil.

When the cleansing process is at last completed, the birds enjoy a spell of unmixed enjoyment of warmth within and without. For this purpose many birds sit enjoying a long leisure on a projecting bough, and sun themselves ; gulls take up a position on the sheltered sides of skerries, and cormorants set themselves in long lines on the warm walls of rock, and gently wave their wings.

When the storms of autumn roar out of doors, and the night is cold and wet, while we ourselves are sitting in our warm rooms, we now and then think of the birds that are forced to spend the night out, and to sleep under the open cold sky. But when we console ourselves with the idea that they pass the night in their nests, there is more of comfort in this for ourselves than for them. Besides the common sparrow, and its cousin the tree sparrow, together with some of the woodpeckers and birds of prey, they one and all leave their nests at the end of the breeding season, and pass the night as best they can, huddled together on a bough near the stem, or in a thick bush.

Most birds sleep singly, but some flock together towards evening in great companies, and spend the night at a regular sleeping place. Thus rooks have usually their night-quarters in some particular trees in a thick grove or corner of a wood. They come hovering stilly and silently as soon as the dusk has set in, sometimes singly, sometimes a number in scattered companies, and arrange themselves. Not so silent are the starlings, these choose the thick reed-bed that covers the banks of still waters, or, when this is not to be had, spend the night in a thick tree-top. They come flying in close flocks, fly for a time to and fro over their sleeping place with whistling wings, and only come to rest at last after a long screaming, chattering, and noise. Some smaller birds, such as yellow-hammers, pass the night in flocks in thick bushes, where they assemble bit by bit in the course of the evening : here also the twittering and noise goes on incessantly till at last the disturbance gradually ceases, more and more of the little beaks disappear under the wings, and by midnight all is still.

Sleep is short and light among them all. Many waterfowl, especially the long-legged waders, sleep standing on one leg, concealing the other among the feathers of the belly, many swimming-birds sleep on the water, and keep themselves against wind and stream by an unconscious paddling with their feet. The nightjar sleeps lengthways along a bough, the woodpeckers within their holes, where they hang in a climbing position on the inner wall of the hole. Many waders prefer to sleep standing half out in the water.

The slightest disturbance of their night-rest deprives them altogether of their self-possession. Most utter a frightened scream, and fly right out into the air; others do not venture far, but settle themselves to sleep again as soon as they can. Some do not sleep at all after any such disturbance, but fly about restlessly the whole night.

Birds too can dream, which one may pretty often observe in those that are kept in cages. What they dream of one cannot well say. In spring and autumn one may see them flutter in their sleep, and then, no doubt their thoughts fly out upon the long migration to the far-off south.

CHAPTER II.—THE PAIRING SEASON.

Spring is the bird's festival—arrayed in their nuptial dress, singing and jubilant one after another the migrants return. All the old birds revisit their former dwellings, and the young birds mate and take a new one.

But it is not given to all to live with a mate, many spend the summer in single blessedness. These supernumeraries are nearly all cocks: they rove about all summer time without a home, ever ready to fight for a hen, or to comfort a sorrowing widow. And there are many instances of such a widow taking her loss easily: one morning in the garden of the Parsonage of Etne* one of the magpies belonging to a nest was found dead, probably from having eaten part of a poisoned fox, but in the afternoon of the very same day came the other bringing up a new spouse. Hens are less easily replaced, and this seems to be the reason that there are more single males than single females in nature.

Most birds have their own especial way of making themselves agreeable to their hens, and this manifests itself not only in their voices, but also in their peculiar movements. Birds of prey float by the hour in company with their mate under the blue heaven, and perform the most beautiful evolutions as they fly, the nightjar floats with active turns backwards and forwards, and its otherwise noiseless flight is accompanied by a drumming sound; the common bunting, the larks, and others, have at this time a wonderful manner of flight, with their feet hanging down and their wings quivering, as if they could not fly properly; the wagtails and common sparrows dance and hop before their chosen ones, as we have often seen: the titlarks, the wheatear, the whitethroat, and some others, rise from a stone or bush singing into the air, and sink down again in a slanting direction to the same place; the common snipe makes its extraordinary bleating, which does not proceed from its throat, but from the vibration of its tail-feathers as it sinks in its flight; the ducks swim round as if they were half-mad, half above, half under water, with their bodies flattened and wings spread, and all these movements are to win the hen.

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* In Bergenstift, in Norway.

These energetic expressions are especially conspicious in the gallinaceous birds, and most particularly in the courtship of the capercaillie and the blackcock. In the case of these birds the attachment between the pair is but feeble, seeing that they live in polygamy like tame poultry, but at the pairing season this instinct is all the more powerful. The courtship consists of the love-song and dance with which the male endeavours to awaken corresponding feelings in the female, and his powerful tones resound like an echo from the whole of awakening nature in the young spring day, through all the forests of Scandinavia.

The ruff, that long-legged snipe-like bird, whose long neck is adorned in spring with a ruffled collar of feathers of all conceivable colours, goes still farther, he takes his stand like the knights of the middle ages, and goes through a sham-fight to win his love. The champions encounter each other in an appointed place; with levelled lance and lowered wings they rush at one another, but the blows are parried by the great ruff, which stands out on all sides like a shield. No blood is shed in these battles, at the worst a feather flies off, and the contest is over, and peace and friendship again established between the combatants. The outward and visible homage of the cock for the other sex can find no more beautiful nor complete expression.

But not only by these and by other movements, but by clear and intelligible words does the cock make known his tender feelings. This is why the song of birds is strongest and most beautiful in spring, but is silent when parental duties take up their time, and the mates are after that separated. Thus the cuckoo, the landrail, and wryneck, become almost invisible when pairing time is over. In spring-time the nightjar utters a hoarse and ill-sounding shriek, which it never allows to be heard at any other time, the jay makes music in the most wonderful keys, and some of the smaller birds, that at other times do not sing, as the grey flycatcher, and the red-backed shrike, every now and then, but very seldom in the neighbourhood of a man, give utterance to a short and musical strophe, which is their proper song.

The black woodpecker testifies to the same feelings, when on bright spring days he produces on a dry tree stem the strange trumpeting sound, which has just the same effect upon the hen as if the bird had the gift of song. In short, every species has its peculiar movements, its peculiar modulations of voice, and endless other ways with which it seeks to show to its favourite the strength and heartiness of the love which he cherishes for her.

If an unauthorized stranger tries to approach the place where the cock is trying to win himself a mate, he is received with beak and claws, and a battle is the immediate consequence. This battle is fought out, according to circumstances, in the air, in the water, or the field, and often in all three at once. The eagles and falcons dart round one another like lightning, so high up in the blue sky, as almost to disappear from human eyes. The water-ouzel and several other warblers will not endure an individual of their own species in the neighbourhood, and every one that comes near is looked upon and attacked as a rival. But other birds, such as the common sparrow, starlings, and many others, take this business more lightly and treat each other with a freedom which often degenerates into weakness.

Love makes both deaf and blind, as every Scandinavian sportsman knows, when, with his gun cocked, he stands motionless and silent during the capercaillie's love-song. Next moment the well-known grinding noise is heard from the bird's beak, and then the shooter runs forward so long as the sound lasts, stands still again when it ceases, runs forward again the next time, till he gets within shot. Anyone who can imitate the cuckoo's voice can with ease decoy it to the tree under which he stands; the ringdove instantly answers his false rival who decoys him, and the golden plover comes with neck stretched out over the tussocks of ling when one imitates its melancholy whistle.

At last the cock has gained his object, often not without many combats and disappointments, and enjoys the undisputed possession of his mate, and then the happy pair begin to think about fitting up a house and home.

Nearly all our native birds are monogamous, and their union, at any rate in the case of many species, seems to be for life. That this is so, can often be seen in those which winter with us, and travellers have observed that they, in their winter quarters in southern latitudes, consort in pairs in a more than accidental connexion, although they do not breed there.

The capercaillie and blackcock live, as every one knows, in polygamy, the cock having a number of wives, while the contrary, polyandry, is the case with the cuckoo and the ruff and reeve, one hen being the object of several cocks attention at the same time. It is supposed that the cause of polygamy among birds is an excess of food consequent on a want of exercise. Hence we see that ducks and geese, which are monogamous in a wild state, become polygamous in captivity with abundance of food.

As soon as the birds are fully developed, which in the smaller species is the case in the second, in the larger not till the third and fourth year, they mate, and the only exceptions to this are sometimes certain birds of prey and gulls, which often form a union while still in their younger plumage.

The pair cling to one another in life and death with a touching affection. Thus the ravens, jays, and finches, when they have once come together are seldom for many minutes separated. But if one of the two dies the hen is the first to get the better of her sorrow, and her widowhood, as we said before, does not last long. But if the hen dies, the almost certain consequence is that the other remains solitary the rest of the year. In this case the sorrow for the lost is visible, and it often happens that the survivor will not leave his dead mate, but remains sitting by the little corpse till he is driven away.

Among all polygamous birds is the attachment between the cock and hen very weak. As soon as the hens are at rest under the shelter of a spruce fir or a juniper, the cocks betake themselves into the deepest parts of the forests, where they spend the summer, hidden, and shunning the whole world, and it is not till the beginning of autumn, when the young are full-grown, that the father again returns to his family, and honours them for the future with his company. Several of the ducks do the same; the drakes collect into large flocks at the beginning of the hatching season, and live a jolly bachelor life far away from wife and children; thus the eider-drakes make off to the sea, and do not shew themselves along the coast till far on in the summer.

Another consequence of the polygamous tendencies of certain birds is the hybrid forms which rove about our forests. Thus the bold blackcock not only visits the hen of the capercaillie (*Ror*), when her proper lord and master has either been shot or happens not to be at home, but even goes altogether out of his own family and visits the hen of the willow-grouse (*Lirype*). In the first case comes a hybrid (*Rakkelhan*) of which the male is a cross between the capercaillie and the blackcock, and the female is just like a small Ror, in the latter case the rare Rypeorre, which is pied, and resembles both a blackcock and a grouse. Such hybrids have been also observed among some of the finches, swallows, and ducks, but, fortunately for science, they are the greatest rarities.

In the cuckoo the tie between the sexes is still weaker, and is entirely broken off when the breeding season is over. The cock troubles himself no more about the hen, and she no more about her eggs, and so with these birds every trace of family life disappears.

CHAPTER III.—NEST BUILDING.

If there is any part of a bird's life which is more likely than another to attract every one who has an eye open to nature, it is the time of laying eggs and building nests. Even among birds can love create artists; the cock gives the rich gift of his song, the hen contributes the capacity for constructing a cradle for her young.

Almost all birds have their distinguishing characteristics while building their nests, and their individuality is never more conspicuous than it is just during this the most beautiful time of their lives.

Usually every species builds its nest in whatever seems the most convenient place, without troubling themselves about other birds of their species. Many however in the breeding season gather into great flocks, and breed in society at the same place. Among land-birds is this especially the case with the swallows and fieldfares, but the swimming birds far surpass even them. Gulls, cormorants, auks, puffins, and guillemots breed in innumerable swarms on the same bird-rock. These bird-rocks, on which nest lies close to nest, and bird sits close to bird from the top of the rock down to the surf forming at its foot, are very numerous among the perpendicular cliffs of Finmark and Nordland, and on some parts of the coasts of Great Britain.

Comparatively few birds use their nest more than one year. Most, as soon as the young are flown, treat it as if it did not exist. Only the swallows, individual woodpeckers and birds of prey, sparrows and starlings, use it regularly year after year.

Every bird chooses for its nest the place which seems best to suit its own peculiarities and manner of life, and one scarcely can find a place high or low, by waterside, or on land, in forest or field, in copse or on mountain, which they do not use. All endeavour to keep the nest out of sight, but they do not all do so in the same way, but, if possible, they contrive that it shall be naturally protected, either by its resemblance to a tree or to the ground on which it rests, or by hindrances which the bird conceives to be unsurmountable to its enemies.

In the choice of its nesting place the bird carefully takes into consideration all the circumstances and dangers which can have an influence on its nest. But it sometimes happens that she miscalculates; thus the water-ouzel builds her nest so low on the river-side that it is carried off by a spring-flood, and the redstart and the white wagtail often build their nests on the scaffolding of a building under construction.

From some inexplicable reason birds now and then choose their breeding place just where one would least expect it. The garden-warbler often builds in a bush which stands so near to a frequented road, that every one who passes by must needs see it. A fly-catcher's nest has been found in the handle of a spade hanging on a peg in a tool-house; the hen allowed the nest, when the spade was wanted, to be taken away and laid on a shelf just by, provided that it was put back again into its place, when the spade was again hung up against the wall. A redbreast chose a still more extraordinary breeding-place, and built a nest in a bag which was hanging in an out-house, and in which a gardener kept his tools, but the gardener, who could not do without his tools, and would not on any account disturb his little tenant, made just such another bag, shifted the nest, eggs and all, into this, and hung the whole up in its place, in which arrangement the bird entirely acquiesced. Another pair of redbreasts built in a garden-engine, that hung from the bough of an apple-tree, and one took up its abode in a carpenter's shop, without being disturbed by the noise and din of the many workmen, and built the nest of the nearest materials, to wit, shavings.

Seldom do birds settle quietly in a place in which the usual conditions for a convenient breeding place are wanting: but it sometimes happens so, and in this case the bird seeks out the nearest things that will answer the purpose. On the high mountains, where there are no steep sand banks, the sand-martin digs its horisontal tunnels in the roofs of the Sæters[*] in districts bare of trees, as in Jæderen[†] the magpies build in bushes or on the roofs of the houses, and the Hooded-crows, elsewhere so shy, take up their abode either on the ground, or the few stunted fruit trees that may be found round the farm-houses, often quite close to the walls of the living-rooms.

No bird likes to be disturbed when building. Many desert the nest at once, when they see that they are discovered, especially is this the case with the wren, which almost always makes off if one, only for a second, stands and watches them while building.

Generally birds build only in the early morning, when they have no particular cause for haste, and even then all work is stopped during rainy weather. Swallows are obliged to work at intervals in order to let the finished part of the building dry sufficiently; and here they have to practise patience, which indeed, in long continued wet weather is often put to a severe test.

One can draw no conclusion from their nests as to the resemblance and mutual relationship of species. Thus some ducks breed on the bare ground, others in holes which they dig for themselves, others again in hollow trees; some titmice lay their eggs in a plain nest in holes in trees, others build among the boughs, and these belong to the most elaborate nests we can point out. Thus the nests can in one way only be arranged according to their situation and construction.

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[*] Summer dwellings of the girls who tend the cows and make cheese on the high mountains all over Scandinavia, just like the chalets in the Alps.

[‡] In the S.W. corner of Norway.

If one observes birds while engaged in building, one sees at once that the real builder is the hen, the cock being, in general, nothing more than, as it were, the hodman; sometimes he does not even help in the collection of materials, but leaves the whole business to the hen. This is the practice of the garden-warbler and the chaffinch, which employ the time, while the hen builds, in cheering her with their song, but never are allowed to touch the nest. In the case of the Shoveller duck, and doubtless several other of the duck-tribe, the duck seems to hide the nest with the greatest care from the drake who would otherwise never leave her in peace during the hatching season. Among some birds however, *e.g.*, the swallows, the cock faithfully assists his mate in the building of the nest.

The component parts of the nest are brought, in preference, from the neighbourhood, when possible. Thus if the spotted flycatcher, a bird nowise fastidous in the matter of nesting place or materials, has taken up her abode in a yard, either under a tile, or in a hole in a wall, she prepares a nest, which may be composed at once of bits of wool, straws, feathers, scraps of cloth of all sorts and sizes, bits of paper, threads all different kinds, even bits of wire, &c. But the bird has often to fly no little distance when some particular substance is required and which is not easy to be found. Thus 99 times out of 100 the nest of the Siskin is lined with the white down from catkins of willows; the long tailed titmouse with black-cock* feathers, and the chiffchaffs with horsehair.

Raptorial birds alone carry their materials in their claws, all the rest in their beaks. Dry twigs are mostly gathered in the open field, but are also broken off from the trees, as we see rooks and starlings do, these birds are also so clever that they are up to using the loose twigs in their old nests. Lichen and moss come from the nearest trees, feathers are often caught in the air, or collected on the places where a bird of prey has devoured a small bird. In the northern parts of Scandinavia the small birds make use of reindeer's hair and grouse's feathers.

In various different ways does the bird set about fastening, plaitting, and binding together the nest materials. The longer stalks of grass, fibres of bast and threads she winds round the bough by flying round it, the single small pieces are first moistened with her sticky spittle, and are then carefully pushed in and made fast. Lastly the inner surface of the nest is, by means of the feet and a swift turning-round of the body, made smooth and round, the breast being thrust against the upper edge of the nest, and now is the house pronounced by the builder ready to be occupied.

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* The reader must bear in mind, especially in this chapter, that these papers were written from the Scandinavian point of view.

The simplest nest which we know of is the nightjar's, which can scarcely be said to exist at all. The eggs, quite unsheltered are laid on the bare ground, but are nevertheless secured from discovery by the colour of the bird and the eggs, which agrees exactly with the ground on which they rest. Some of the owls and birds of the auk family scarcely do more; the Skua-gulls, the Terns, and our wild forest-grouse* just scrape a hole in the ground, or put a couple of stalks of grass together as an apology for a bed for their eggs. The Willow grouse, † the Looms § and Gulls put together a simple bed of grasses, and some of the Waders show also a certain sort of instinctive skill; such is the hollow in the sand which the little Ringed Plover chooses as a lodging for its eggs, beautifully laid with little bits of white mussel-shell, and small round stones, quite like a variegated mosaic.

Those birds of prey which build upon the ground, such as the Short-eared Owl and many Falcons, build a true nest of twigs and long grasses. The Landrail is one of the best nest builders among our waders, and lines its nest with grass and reeds. All the Anatidæ build large and warm nests, the Swans, which breed on the lakes and rivers of Finmark, get together such a prodigous nest as to bear a man without sinking. The Geese do not take so much trouble, but still fill their nests with down like the Ducks. These last employ this material in such abundance that they surround the nest with quite a rampart of it, and sometimes, as is the case with the Eider ducks, only just let a glimpse be caught of the head of the sitting hen.

The best builders of nests on the ground are the small birds, such as the Larks, the Yellow hammer, the Titlarks, and sundry other. All these twist grass and hair into a most complete nest; the Willow Warbler and the Chiff-chaff however arrange it with greater art, seeing that these birds furnish it with a vaulted roof and line it softly with feathers and moss.

One can observe equal eminence in skill in the species which breed in holes in the ground or in trees. The owls take possession of a natural or artificial hole, and there lay their eggs without anything beneath them, on a bottom of stone, earth, or wood as it may chance to be. The Puffin, the Shell-drake and the Sand-martin hollow out their holes in the ground, their eggs lying within on grass. The Wheatear, the Pied Fly-catcher, the Starling, the Redstart, the Tree Creeper and several of the Titmice breed in holes, which they seek out, but construct even here a tolerably artistic woven nest. Other

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* viz. Capercaillie, Black-cock, Hasel-hen (Tetrao bonasia).

† Lagopus subalpina very like our Grouse.

§ Blackthroated and Redthroated Divers.

Titmice excavate themselves a nest-hole in rotten tree stumps, and next to them come the master builders in this particular art, the Woodpeckers, which hollow out a regular and beautifully formed abode in the inside of the stem of a dead tree.

A peculiar family, closely related to the Geese, viz., the Grebes build a nest partly or entirely floating. Their nest, of water-plants twisted together, rests commonly on a floating piece of wood or the like, but lies mostly so low, that the water finds its way in, and quite surrounds the egg, so that it is quite impossible to understand how they can be hatched. The same is often the case with the eggs of the Looms.

The most indifferent nest of all the birds that breed in trees is that of the Ringdove. This consists properly of twigs irregularly put together, so loosely twisted together that the eggs can be perceived from below. The nests of the Garden-warbler and the Whitethroat are thin and poorly-built, and weakly fastened to the bushes or the tall plants in which they are built.

Birds of prey build better, and yet they, when they can, avail themselves of an old common crow's nest as a foundation; the nest is flat, but built so large that one end of it forms a dinner table on which their food is served to the young birds. Birds of the crow kind attain a still larger measure of skill, the Siberian jay (*Garrulus infaustus*) weaves a beautiful and smooth nest of lichen from the Spruce-fir, of moss and feathers, and the Magpie, with its cosy dwelling with an arched roof, is quite an artist.

But far beyond all these, come those whom we are about to mention. The dexterity of the fore-mentioned birds can go no farther, and their performances can be executed to a certain extent, by the handiwork of man, but a peculiar cement enters into the composition of the nests that we are coming to which can be produced only by the bird itself, namely, its spittle. These classes of nests we will divide into two main divisions, according as glueing or weaving is mainly employed in them.

We may consider our Thrushes as beginners in the former of these two methods. These form a foundation of cemented earth, and clothe this with dry grasses and leaves; the song-thrush makes the best work of these, the inside of whose nest consists of a combination of earth, chips and spittle, as hard and smooth as a cup. The Nuthatch, that blueish little bird that climbs about the trees as nimbly as a fly, and whose habits place it between the two birds from which it derives its Scandinavian name, Spet-meisen (Woodpecker-titmouse) employs the earth in a different way. It finds out a good hole, preferring one made by a Woodpecker, but as the entrance is invariably too large, it builds up the opening with a coating of earth or clay often two inches thick, and this is so hard, that it can scarcely be cut with a knife, and leaves a hole no larger than the little bird can itself slip through.

But the master-builders in this department are the swallows. We have all seen how the swallows and Martins build their half-cup shaped nests, the former inside buildings and barns, the latter outside. These nests consist almost entirely of clay, which they glue together, and fasten to the often perpendicular beams and cornices. The swift, that black, screaming bird, that skims in great flocks, with a whistling flight, round churches and high buildings, never comes down to the ground, for its wings are so long that it cannot without help rise from it, and its feet so short and undeveloped as to be of little use except to cling with, so that it cannot collect clay in this manner. Unless therefore the swift can make itself master of a sparrow's nest, no matter whether an old one or one occupied, in which latter case the young sparrows are without remorse thrown down to the ground, it plasters up for itself a nest principally of spittle and whatever other materials come to hand. And this forms a transition to the well-known Indian swallows, whose nests, which come entirely from the bird's own throat, consist of a gelatinous mass, which hardens in the air, and forms the eatable bird's-nests.

It is, however, among our weavers that we find our most scientific nest-builders. Most of the finches may be considered master-builders, and every one who has seen a chaffinch's nest, must admit that he can scarcely imagine a more scientific nest. The chaffinch plats moss and dry grass together, and on the outside covers it with little bits of lichen and the white membranous bark of the birch, all fastened together with cobwebs and the bird's own spittle, and with this covering it is so like the lichen-grown bough on which it rests, that it often escapes the sharpest eye. The inside consists of a thick layer of warm materials, such as feathers, moss, hair, wool, and fur, from animals and plants, &c. But all is so smooth and so cleverly woven together, that one must use force to tear it in pieces.

In middle Europe is found in great abundance a peculiar kind of warbler (*Calamoherpe*), very rare in Scandinavia, but nevertheless found here and there as far up as Finmark. This bird fastens its basket-shaped nest among reeds and rushes, so that it hangs with nothing between it and the water, merely fastened on each side to the weak reed-stems. The *Yellow-breasted Warbler (*Sylvia hypolais*), her match both in singing and nest-building, forms a charming nest among the thinner branches of a bush or a low tree, which resembles the chaffinch's, but externally is quite white with the finest birch-bark, and is so tightly woven together with spittle and cobweb as to form an almost hard bowl. Here, on a bottom of dry grass and feathers rest its rose-red black-spotted eggs, which are unsurpassed in beauty by any of our native species.

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* Not British, but British ornithologists have given the name of S. hypolais to the Chiff-chaff.

Still higher than these stand the golden-crested wren, the water-ousel, and the wren. The nests of these are as round as cannon-balls, and are furnished on the side with a narrow entrance hole. This they all place in the most hidden spot in the place they live in. The golden-crested wren weaves it of moss among the fine pendulous spray of a spruce-fir, and conceals it entirely among the needle-leaves. The water-ousel fastens hers among the fissures of rocks, or the beams of an old disused saw-mill, invariably well hidden among ferns and grass, and, when possible, in preference, on places that hang over a foaming waterfall; and the wren, that little elf among birds, with his little stump of a tail stuck upright, forms its scientific nest far in among the hanging roots in a landslip or hollow way, its constant resort, and where, like the ousel from the river bank, it lets its song be heard at every season, in the bitterest winter cold, as well as in the sunny spring days.

But none of our native birds build so clever a nest as the Long-tailed Titmouse. The bird itself is the most graceful creature one can conceive, and when it flies from tree to tree with its little white breast, and its long tail coming after, looks for all the world like a bunch of wool driven before the wind. And, scarcely has the spring sun melted the snow on the first brown spots on the south slope of the hill, than it begins to think about its nest. On the branch of a birch or of a young spruce, it forms in the course of three weeks time a great oval dwelling, quite closed at the top, and only furnished with a hole large enough for the bird itself to slip in, about the thickness of a man finger. This nest is often 6 inches high and 4 wide, but is made so large because it is designed to hold not only the sitting hen, with all her long tail, but by night the cock too, besides all the young ones, which sometimes are as many as 16. Externally it is covered with the finest lichen, strips of birch-bark and moss, and yet in spite of its size, it harmonises so well with its surroundings as to exactly resemble the lichen-grown stump of a bough. And it is as snug and warm within as it is beautiful without, quite filled, often with large feathers, almost always from the Black-cock, which the active birds seek out in the forest hard by. Nene of our native birds' nests can be compared with that of the Long-tailed Titmouse.

One European bird only does not sit upon it's own egg. The hen Cuckoo, much less the cock, troubles herself neither with the building of a nest, nor the hatching of her eggs, nor the rearing of her young. This business she leaves, as every one knows, to other insect-eating small birds, in Norway generally to the Winchat, the white wagtail and the titlarks, who have this burdensome duty imposed on them. The reason of this strange phenomenon, which goes through the whole cuckoo family, which in the tropics counts not a few species, has been sought in the extraordinarily slow development of the eggs in the cuckoo's ovary, each egg requiring about eight days in order to be ripe enough to be laid. Now should the hen, which lays in all from four to seven eggs, herself hatch them all, the first-laid would be addled when the last is laid, and she could not possibly hatch them one by one. But this explanation only brings one to the farther question, why are the eggs so slowly developed? This, and more, which we shall point out as opportunity offers, belongs to the many still unexplained facts, which mark the history of the propagation of this bird.

CHAPTER 4.—HATCHING AND REARING.

Again and again flies the hen to the finished nest, contemplating it within and without to put it to its final proof, and the cock's jubilant song and the hen's quiet joy prove that the work is satisfactory. Again affection begins to stir them, the cock renews his tender attentions till he wins the victory.

Next day the first egg lies in the nest, and the remainder follow, one every day till the number is complete. The larger birds of prey allow one or two days to go between each egg, the cuckoo-hen nearly as many weeks, individual titmice sometimes lay an egg also in the afternoon. The eggs are laid early in the morning, in general between 6 and 8 o'clock. While the egg-laying lasts the birds seldom keep near the nest, but often spend the day at some distance from it. Only a few species begin to sit when the first egg is laid, but they may often sit in the nest for warmth in bad weather.

The time of egg-laying varies from the close of March up to July. The earliest are the owls and ravens, which often have eggs in the last days of March; in the case of the other birds of the crow kind the hatching season is about the middle of April. Next come the titmice, the ernes, the woodpeckers, the herons, and the grouse-kind,* that mostly hatch about the beginning of May. The immigrants are the last, thus the yellow-breasted warbler† and the spotted flycatcher seldom have eggs till June, the quail and the swift often not till even July.

The cross-bills are the only birds which in their nest-building and egg-lying are not bound to any definite time. In general the hen hatches off her young in January and February, in the very middle of the severest winter cold, and therefore constructs a nest of which the lining and the size are intended to withstand it. But yet the cross-bills often hatch in June, and throughout the whole summer, and in this case the nests are small and airy. The cause of this deviation from the usual habits of birds, must be the fact that it is just in winter time that the seed of the Scotch fir, the principal food of these birds, is fully developed, and it is unquestionable that a super-abundance of food not only hastens the laying time of birds, but also makes them more prolific.

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* Viz.: Capercaillie, Blackcock, Haselhen, Willow-Grouse.

† Sylvia hypolais (Lath).

Most of the larger birds lay once a year only. But among many of the sparrow family, and swallows, finches, larks, and yellow-hammers, the older individuals sometimes lay two sets the same year, the common sparrows as many as three or four, according to the character of the summer and the abundance of food. If one takes away carefully the eggs from a nest, but leaves, carefully, at least half, the birds readily lay more than their normal number, and some, for instance the wryneck, together with several of the falcons and ducks, seem sometimes to be unwilling to stop till the nest is full. Thus, by taking a reasonable toll, one can have no inconsiderable profit, especially in the case of the species which hatch in colonies on the bird rocks, but also in those which breed singly, as the ducks. If all the eggs are taken away, the nest is deserted, and the birds usually build a new one in a different place; this time the hen generally lays fewer eggs than the first time.

The numbers of the eggs varies very much. As a general rule, which has but few exceptions, we can say that all the species which live on vegetables mixed with animal food, lay the largest number of eggs; next come those which live more exclusively on plant-food, and last of all the birds of prey and most of the sea birds (except the duck family) which live exclusively on animal food. And this difference in fecundity exactly tends to preserve the balance between the species. For if, for example, the birds of prey were more prolific they might well threaten whole families of other animals with destruction, and if the gallinaceous birds did not lay their large number of eggs, they would inevitably meet with the same fate as many birds in New Zealand, and soon become extinct by reason of the persecutions to which they are incessantly exposed from men and animals.

The partridge lays the largest number of eggs, having twenty eggs and even more in its nest. The ducks, except the eider-duck, lay likewise a great number, ofteneest twelve to fifteen, our wild wood-grouse have generally eight to twelve. The crakes are also prolific, thus the corn-crake and several with us rare species of the same family lay about ten eggs. Of smaller birds the Wryneck lays from eight to twelve, the long-tailed titmouse as many as sixteen, on the whole the tits are prolific birds, and most of them lay 7 to 10 eggs. The greater number of the sparrow tribe lay on an average five eggs, and nearly all the waders four. The diurnal birds of prey have mostly three eggs, whilst the owls often lay more; three is also the number laid by nearly all gulls and terns. The doves, the swifts, the skua gulls, looms, nightjar, black guillemot, crane, and individual diurnal birds of prey, have two. The only birds which breed in Scandinavia which have have one egg only are the auk, the guillemot, and the Puffin.

It is a most remarkable fact that the same bird lays a larger number of eggs in the temperate than in the warm zones. This can be shown even in the various latitudes of Europe; thus the average number of many small birds' eggs is higher in Scandinavia than, for instance, in Central Germany.

The size of the eggs has often but little proportion to that of the bird. The black guillemot lays eggs as large as a hen's egg, although it is, itself, the same size as a dove; the common sandpiper lays eggs, larger than a magpie's, a much larger bird. On the other hand a cuckoo's egg is never bigger but often smaller than a sparrow's, and is sometimes laid in the nest of the diminutive wren, whose skin, feathers and all, is but a little bigger than the cuckeo's head.

The shape varies equally, and not seldom differs from the usual so called egg-shape. Thus, in the case of the Swift and Nightjar it is cylindrical and approaches the spherical in individual owls. The eggs of the waders are for the most part unusually large, and are strongly pear-shaped, and are invariably laid in the same position, viz. with the pointed ends all together. The reason of this is obvious, in that in any other position whatever they would take up more room than the sitting hen could cover. But the Guillemot's egg is also strongly pear-shaped, and in this case economy of room is no object, for this bird never lays more than one. This lies without anything under it, on the edge of a rock, and often on a perfectly smooth surface, swept by every wind. The bird must at times leave the nest; but how can the egg now escape falling off? just by its shape. If one lays a full, pear-shaped egg on a table or other smooth surface, and blows upon it, one will find that it incessantly rolls round in a circle, without falling off.

The eggs can bear considerable pressure, especially while they still hold their contents. It is well known that one cannot without difficulty crush a hen's egg held between the thumb and forefinger, and both smaller and larger eggs will sustain a proportionate pressure.

The variation in colour may be said to be endless, even in the eggs of the same bird. Many lay purely white eggs, as all the Owls, Woodpeckers, and Doves, but most eggs are varied with red, yellow, green, brown, and other colours of innumerable shades. The Woodpecker's egg is among the most beautiful of all our birds' eggs. These are snow-white and shining, and when freshly blown are of a blueish clearness, and transparent. The eggs of the Yellow-hammer are marked with a number of dark irregular lines on the reddish ground-colour.

The Cuckoo's egg * varies in the most extraordinary manner, and the most marvellous thing is that it seems in colour always to approach that of the eggs among which they are laid. Thus they are a uniform blueish white when laid in the nests of the Whinchat and Wheatear, but spotted † in the nests of the Tree Pipit. How this can be is still a puzzle, and many are the explanations which have been suggested. The most probable is that the Cuckoo carefully seeks out those nests in which the egg which she has just laid differs least from the eggs already laid in it, but this explanation involves the necessity of acknowledging a sense of colour in the bird.

As soon as the hatching time begins the bodily warmth of the bird rises, and some few feathers either fall out or are plucked out on purpose, by which means the so called "hatching-spots," are developed. These "hatching spots," which permit the radiation of heat from the body, are found under

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* As the subject of cuckoo's eggs has lately attracted some interest, I add some remarks on them taken from Herr Collett's little work on the ornithology of the neighbourhood of Christiania:

"The species of birds in whose nests the cuckoo most commonly lays her eggs in the neighbourhood of Christiania are ANTHUS ARBOREUS, MOTACILLA ALBA, and SAXICOLA RUBETRA. Prof. Rasch speaks of a remarkable example of an egg being laid in the nest of EMBERIZA HORTULANA, a bird which is partly granivorous, but yet during the hatching season mainly insectivorous. They are laid from the very beginning of June on into July; in 1857 I saw a fresh egg in a tree-pipit's nest on the 5th of June.

"Among the many still unexplained phenomena which characterise the history of this bird is the generally accepted fact that the cuckoo's eggs, which vary one from another to a great extent, do in colour, more or less, approach the eggs among which they are laid. This have I found invariably the case; thus in a nest of SAXICOLA OENANTHE, among the blue white eggs, lay a cuckoo's egg, whitish with almost invisible spots, and, size not being taken into consideration, remarkably like them. In the nest of SAX. RUBETRA have I seen cuckoo's eggs blueish green, often without spots, in that of ANTHUS ARBOREUS closely covered with brown spots on the dark ground colour, in that of MOTACILLA ALBA, with small blueish grey spots evenly spread over the whiteish ground colour.

A great help to the explanation of this will be to ascertain whether it is the case that the same cuckoo-hen, which is believed to lay from five to six eggs, always lays such as resemble one another in colour, or whether the eggs from the same hen vary. If the first is the case, Prof. Sundevall's explanation seems to have great weight, viz., that the cuckoo which has been brought up in the nest of a certain species of bird, not only has the property of laying eggs which are like those of that species, but also an instinct to lay eggs in nests of the same species. In the latter case, which is however the least probable, it can be explained in a different and less intricate way. The moment one comes to the knowledge that the hen lays her egg on the ground, and carries it in her bill to the nest which is to receive it, (for in no other way could it be introduced into many wagtail's nests, or into that of the above mentioned wheatear), can one take it for granted that the hen, which cannot be denied the power of distinguishing between colours, searches out among many nests which she has already found, that in which her egg is least unlike the rest."

† This word (plettede) may mean also stained, speckled, blotched.

the belly, and are one or two in number. In general they are peculiar to the hen, but the cock also has them in those cases in which he takes a part in the hatching. In the Phalaropes, whose economy differs from that of most other birds, inasmuch as the whole of the hatching and nurture of the young birds in their case rests exclusively on the cock, while the hen takes no trouble whatever about the matter, the cock alone has these spots. In the Doves and some swimming birds they are wanting entirely.

The duty of hatching lies upon the hen almost entirely, the cock but seldom taking this work of patience on him. But he often procures food for his mate, and contributes in various ways, mostly with his song, but also with his performances in flying, to make the time pass quickly to her. When a cock Titmouse comes near, with food, to his sitting hen, she is aware, even at a distance, of his approach, and she never omits to answer him from within the nest, and even comes to the entrance hole to receive what he has to offer her. But in the case of several birds, the cock assists his mate in the hatching. This is so with the Woodpeckers, Doves, and also several waders and swimming birds, the hen sitting all night, the cock only by day, and always for a shorter time than his mate.

It is a very remarkable fact that in great colonies of birds such as those on the bird-rocks on our northern coasts, the hen seems not seldom to sit on eggs which belong to another bird ; thus their hatching is a kind of joint stock business. Faber the naturalist drew from a hole, in which lay one single Puffin's egg, six sitting Puffins one after the other, in one day.

The bird, during the time of sitting, approaches its nest with the very greatest carefulness. She comes flying, without uttering a sound, often from the same quarter, stilly and carefully she slips in, and sits on her eggs. But most, when disturbed, give audible notice of their anxiety, and fly frightened round the nest. Others under these circumstances maintain their caution and quiet, thus the bullfinch, during the sitting season, scarcely ever lets a sound be heard, and for this reason is but seldom seen in our forests during the summer, although they breed on the hill slopes all round us.

But no bird has this last peculiarity in a higher degree the waxwing. Up to within ten or twelve years ago the movements of this bird were a complete mystery, and the most wonderful stories of its summer abode and nest-building were current in the published accounts of its natural history. A persevering Englishman, Mr. Wolley, had the good fortune to lift the veil, having found several nests in the wide desolate forest tracts of Swedish Lapmark, and not always far from the dwellings of men. The reason of their having been able so long to conceal themselves from search is simply the astonishing cunning and carefulness shown by the sitting bird about its nest. That they never let a sound be heard was to be expected, but in general they left the nest long before any one came near it, and if it was ever taken by surprise, it could be seen how the bird let itself fall to the ground like a stone, and stole away without the least noise, and never came within sight of the nest again for many hours.

Other birds are so phlegmatic that they let their eggs be taken from under them without making any movement in defence. This is the case with some of the guillemots, puffins, and other sea-fowl. Titmice, fly-catchers, and the water ousel often sit so close on their eggs as to let themselves be taken by the hands, and many quails, corncrakes, and partridges are cut in two by the scythe, not having forsaken their nest in time. The eider-ducks, which in the north of Norway and in Iceland are almost domesticated, allow themselves to be stroked on the back, while sitting, without showing any other displeasure at this familiarity but ruffling their feathers and producing a hissing sound, and, when they fly off, they sprinkle the eggs over with their liquid droppings to secure them from being touched.

The mother-love is now days and weeks in attaining its object, and day by day the little germ is developed within the egg. In order that the eggs may be uniformly warmed, they are turned round at least once a day, and they are invariably so placed in the nest as to take up the least possible room. It often happens with birds that lay on the ground, that one or two eggs either by being turned or in some other way roll out of the rest, but these eggs are never brought back by the bird, but are left and spoilt. Such eggs are not seldom found in the case of the partridge, quail, and wood grouse.

The time during which the bird sits varies, but is usually shorter with the smaller and longer with the larger birds. The golden-crested-wren, our smallest bird, hatches off its eggs, which are not much bigger than peas, in twelve days, the hooper hatches off hers in thirty-five. The weather and the situation of the nest have also an influence on them. Thus our tame pigeons sit for seventeen days, while the far smaller quail requires twenty-one and more. If the weather is warm, the young swallows creep out after the expiration of thirteen days, in bad weather the mother is obliged to spend a longer time in seeking for food, so that the eggs are often not hatched till the 17th day.

At last the germ grows into a fully developed chick, and one fine day it hammers with its little beak at the inner wall of the shell in order to come forth into the world. The parents give no help in this, but the little creatures are furnished with a hard scaly knob on the beak which gives them the power of breaking the shell for themselves, and besides this, the shell is itself brittle and cracked as the hatching time is near. With all the sparrows, climbers, doves, and birds of prey, the young come forth from the egg as helpless as a new born babe, and it is not till they are able to fly, which, in the birds of prey, is not for some four or five weeks, and in the smaller birds for two or three, that they are sufficiently developed to be able to leave the nest and help themselves. Warmth is therefore of greater necessity to them at first than food, and it is not till after several days that the parents go out regularly to search for food for them.

But in all the Gallinaceous birds, and also the waders and most swimming birds, the young are so fully developed at their birth, that they can at once run about in their pie-bald down clothing. They remain no longer in the nest, which generally lies on the ground, and can give them no shelter, than until they are thoroughly dry, on which they are at once led by their mother out into the forest, among the reeds, or in the water. Thus one may often see the young partridges, which have just crept out of the shell, run about with a bit of the egg-shell on their heads.

Some waders and water-birds do not, like the rest, breed on the ground, but either in hollow trees, as do several ducks, or in an old crow's or thrush's nest, as do some of the snipes.* But in these cases how are the little new-born things brought down to the ground, for they do not wait in the nests till they are able to fly? Without further ceremony the hen takes them by the neck, and flies down gently to the nearest water, where she sets them down one after another. And it is often enough the case that the distance, which the little creatures are thus carried through the air, is by no means inconsiderable.

The food, of which the young partake in the beginning of their lives, is often different from that of the old birds. Thus most of the granivorous small birds, as yellowhammers, bullfinches, and finches, feed their tender young on insects; the young of some raptorial birds get half-rotten flesh, and the young doves are fed on a peculiar cheesy substance which is developed in the mother's crop.

The rearing of the young is often difficult enough for little birds, when they, like the tits, have a numerous and ever-hungry progeny. So that both parents have quite as much as they can do to get food for their young, and the number of insects, larvæ, and other "small deer" which a pair of small birds can collect in the course of a day, is quite incredible. How many insects a pair of long-tailed titmice must collect every day to satisfy their fourteen or sixteen young ones, no one has ever had the means of computing, but calculations have often been made as to what sparrows bring home, and this shows a total of several hundred insects a day. The sparrow-hawk brings its young, in their greediest time, twenty small birds; buzzards, kestrels, and owls daily carry home at least as many mice.

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* e.g. Totanus, glareola, and ochropus.

One can hardly imagine a prettier sight than a pair of small birds feeding their young. With neck outstretched the little creatures sit in the nest waiting for their parents, and with gaping mouths and piping voices call out for their proper share; and as soon as their whole supply is divided, off they fly again for a fresh one, and begin the feeding over again, never tired, though often themselves contending with hunger.

It is often difficult to understand how, on the whole, the parents are able to procure a sufficient supply of food for all these little ones. But the most incomprehensible thing is how they can divide it equally, especially when the nest lies at the botton of a dark hole in a tree. One often finds, as mentioned before, from ten to sixteen young in a titmouse's nest. The one sits close by the side of another, the one head as like to the other as two drops of water, and not one of the little throats is shut, not one will allow that it is satisfied. The two parents are never at the nest at the same time, and yet each nestling gets exactly its share, never more and never less.

In one case, however, has it been seen that the birds have been unable to come up to the demands made upon them, viz., when a pair have come in for the unhappy fate of having had a present in the shape of a cuckoo's egg. The young cuckoo grows and thrives, its big body wants food, and a great deal of it too, and the unwearied foster parents have to use all their powers to appease its insatiable hunger. They are often worn out by the abstinence they submit to, and are on the point of giving in, when help comes in the shape of a beneficent little bird, often of quite a different genus, which does its best to support them in the burdensome duty which is imposed on them. Thus Prof. Rasch once observed a pair of whinchats assisted by a garden warbler.

With true heroism and a touching contempt for death the parents endeavour to defend their eggs or young from danger. But the weapons which they employ for this purpose are various enough. Birds of prey, plovers, gulls, and terns thrust furiously down at the hunter, and often touch his head with their wing-points, whilst his dogs not seldom feel the sharp claws of the hawks and owls; gallinaceous birds, geese, and other birds are often as bold as these. Most songs birds, as well as certain waders, endeavour to avert danger by dissimulation, flying along the field with piteous cries and hanging wings as if they were wounded, to attract observation away from the nest on to themselves. And this often succeeds with dogs and other animals, but as soon as they are enticed far enough away, the bird suddenly raises its wings and flies swiftly away.

The fieldfares have another means of protection, like that of the eider-ducks, when, as we have described before, they leave their eggs. Only it is aimed directly at one who comes near, and every one who has visited a breeding colony of these birds, must have experienced the danger of disturbing their domestic life.

As soon as the young are able to fly, a new phase of their life begins. The young citizen of the world must be trained to his calling, he must be taught to move himself about in the world, and his parents must be his teachers. They remain in the nest no longer than till their wings can bear them, but the whole family spend the night sitting close to one another on a bough. Gradually the parents cease to bring them food in their bills, but try to accustom them to get it for themselves. One can often see those birds, whose special forte is flying, give their young formal instruction, and as all young birds are obedient children, they catch every motion of their parents, and thus it is not long before they are just like their parents in one and everything.

For a longer or shorter time the young follow their parents, but by degrees, as they learn to take care of themselves, the family bond is broken. With some, however, the family life lasts longer than this, and these form smaller flocks, which keep together all the rest of the year, often in company with other families of the same species, and they no not separate till the next year. The ravens, swallows, most of the titmice, as well as Gallinaceous birds do this. But most trouble themselves no more about their young when once they are able to fly, but leave each one to maintain itself, some even drive them off by force, as the water-ousel. These, disinherited, must now win themselves a place, where best they can, to spend the rest of the summer. The following spring the families shift, and thus passes away this portion of their lives, with its joys and its sorrows, after the manner we have just described.

CHAPTER V.—MIGRATION.

During the winter the songs of the birds are silent in the leafless northern woods. A great number of our winged songsters who seem only created to cheer our northern nature, are not ours entirely, we have them only for a part of their lives. When the autumn wind drives over the stubbles, and trees and bushes begin to change the colour of their leaves in the cold nights, then also is broken the bond which unites the migratory birds to the land of their birth, and they get themselves ready for their long wandering. And before that life in the field and forest is dormant, and the snow spreads its white carpet over slumbering nature, they depart in flocks for the distant south, to exchange the long northern winter nights for life in the warmer zones.

So much for the migratory birds. But all our birds are not migratory. Many stay behind, and spend the winter with us, and even our northern latitudes are the southern winter abode of some species, which pass the summer in the very highest north. But when the spring sun again revives the germs which lie in the bosom of the earth, and urges them to unfold themselves to a new life, then our summer guests do not keep us long waiting, but come back again, one after the other, in flocks and in companies, with joyful spring sounding in their throats, and with summer after them.

When autumn comes, then begins a peculiar life to stir among the birds. The migrants leave their summer quarters and move southwards, and sundry others, which are at rest during the summer, begin now to rove from tract to tract. The wanderings of these birds, however much they may differ with respect to their cause and object, may be comprised under two heads—migration and roving, and thus all birds belong to one or other of three classes, migratory, roving, and stationary birds.

Migration is a necessity to many birds, that is, an inborn instinct, grounded partly on a want of food and partly on an irresistible desire of migrating; it has a definite direction, and repeats itself at definite times. No migratory bird has to be taught this journey, none needs any guide, it moves southwards of its own unchangeable instinct, which it cannot itself control. As the cold season comes on, the insects and other "small deer," which form the food of whole groups of birds, betake themselves down into their underground winter quarters, and their enemies and persecutors have no other resource than to seek for food in foreign countries. Those that live on different kinds of plant-food share the same fate, and their thin feather covering can by no means shield them any longer against our northern winter cold. And even species which have enough protection against the cold, such as geese, ducks, and sundry others, are shut out at this time from access to their food by the ice which covers the waters.

But that it is not only want of food that drives them away is clear in many cases. Tamed wild ducks and geese have food in abundance in their captivity, but, with the approach of autumn, the longing for migration makes them raise their wings. Young migratory birds taken from their nests and kept in cages prove the same thing. They know nothing of the severity of winter, they have no experience of the distant south with its mild skies, and yet when autumn comes and the migration passes over them, they sit uneasy in their cages, flutter round anxiously, and let their decoy notes be heard incessantly; they too would fain migrate with their mates, but become quiet again as soon as the time for migratien is over.

And, besides, birds often depart before they can be aware of any want of food, and before they have yet felt any cold. The quail and the double snipe are so fat that their skin bursts when they fall on hard ground, the cuckoo, the shrike, the osprey, and the short-eared owl, are also enveloped in a coating of fat, nearly all of them are in their best condition, and yet they go. Migration is a mysterious phase in the bird's life history, and always will be, and it is easier for us to fathom the laws for the wanderings of the planets than of the little beings which are found all round us.

The diminution in daylight seems also to have something to do with migration. Thus at the beginning of August the cuckoo has food and to spare, for the hairy caterpillars, which form a substantial part of their diet, are found at this very time in the greatest numbers, the dog-days are in and provide for warmth, and yet they go. But the increasing length of the nights, for which man does not care, causes an uneasy feelings in most birds, the children of light. By night various dangers threaten them, which they can avoid by day and the inactivity of the long nights is uncongenial to their lively nature. Therefore the birds sing for joy when the sun rises, therefore from the top of a tree or some other high-raised place, as long as they can, they enjoy its light, when it is on the point of disappearing.

A connecting link between the migratory and the roving birds is formed by those species which pass the summer either in the arctic regions of our part of the earth, or on high fells, but which in winter seek for shelter in our southern lowlands. They often extend their progress still farther south, and show themselves in middle or southern Europe, and that they come very near to the migrants is seen in the fact that, like them, they are entirely absent from their breeding grounds in winter, which roving birds ought not to do. Such are the waxwing, the hawfinch, the snow-bunting, and the redpole, which all, in larger or smaller numbers, make for the southern and western parts of Norway in winter, and the same is the case with some of the high-northern swimming birds, which winter by the side of the ice in the south.

The movements of the roving birds are neither made at any fixed season, nor in any fixed direction, but it is in general the case that they depend on the nearest supply of food. Extreme cases of this kind of wandering are a sort of incomplete migration, in that a species suddenly abounds in districts in which they were before either entirely wanting, or only found in inconsiderable numbers, and by degrees disappear again. A remarkable example of the first, and one of the most extraordinary phenomena in ornithology in our times, was the emigration which a little Isabella-coloured* and most peculiar gallinaceous bird, the sand-grouse,† took to Europe in 1863. Its home is in the endless wilderness and steppes which extend in middle Asia quite up to the borders of China, but for some, to us, inexplicable reason in that year it spread over all Europe in considerable numbers, and showed itself in almost every country, even in our cold Norway. Thus in the course of August about a dozen specimens were shot, and many more seen in different parts of the country, as far as Bergen, and stuffed specimens are set up in the museums of Christiania and Bergen. They arrived so early in Denmark that they rested on the heaths in Jutland, and even bred in their new home. The next year not one was seen in Europe, their disappearance was as great a riddle as their arrival.

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* See note to The Complete Angler (Walton and Coteon), Part ii, Chap. 7.

†. Syrrhaptes paradoxus.

As examples of the other case, viz., of a species suddenly spreading over a district in which usually only a few can be found, we may mention the rook, the nutcracker, and the crossbills. The two former are of our rarer birds, but in some years have appeared in innumerable flocks over the whole of the south of Norway, and have bred in great numbers; gradually their number has decreased, and in the course of a few years they have disappeared. The cause of this movement, which has a great resemblance to the well known march of the lemmings* to the lowlands, must, as in their case, also be sought for in a sudden over-peopling of their native soil. The crossbills are more gipsyish in their appearance, and their wanderings are more easy to explain, seeing that they are caused exclusively by want of food. The fact is that these birds are so entirely dependent on their main food, the seed of the spruce-fir, that they follow its developement from one tract to another, and if they are found one year in numbers in any place, one may be sure that there has been a sufficient crop of spruce seed, but should the crop afterwards fail, the birds vanish entirely. Thus in 1863 the common crossbills were found in astonishing numbers in the whole valley in which Christiania lies, and bred in great numbers in all the hill-slopes round. But in the autumn of that year there was a thorough failure of spruce-fir seed, and the cross-bills vanished to a bird. The year after they had advanced to Österdal, where the flock remained till the summer of 1866. They then flitted again, and settled in great numbers in Örkedal, and in the Drontheim country, where they still remained in the summer of 1868.

True roving birds are, on the contrary, the woodpeckers, titmice, and most of the crow family; these have no especial object in their wandering, and food is often as good in one place as in another. The siskin seems to be more dependent on its food, and has, on the whole a good deal in common with the crossbills. Woodgrouse are more stationary, and only shift in autumn and winter within narrower limits in the forests; but suddenly and almost accidentally their movements become distant wanderings. Thus it has happened that blackcock and capercaillie in certain years, all at once, and apparently without reason, have left the tract in which they were born and have lived all their lives, and gone to another, but, unable to find their way back again, have been obliged to remain, and have been surprised by spring; the hens lay and hatch their eggs under a bush, and the summer passes away; but in autumn the desire of wandering again seizes them and they disappear, leaving no traces of themselves.

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* Lemmus Norvegicus; a small species of rat, about 5 inches long, seen in some years in immense numbers on the Norwegian and Swedish fells.

We here propose to consider the migratory birds more especially. The largest part of our birds, which in all number about 250 species, are migrants, and only an inconsiderable number are stationary. They cannot be classified, yet we may say that nearly all waders are migratory, all gallinaceous birds, except the quail, stationary.

Every species has a fixed time for its departure and arrival, which under ordinary circumstances varies only a few days. But many circumstances can influence it. First it must be remembered that the advance of the year with us in the north has little or no influence on their arrival, but has a good deal on their departure, which always depends on the state of the weather at the place from which they go. The spring of 1867 was more than usually severe all over Europe, and heavy snow-storms occurred as late as May, less severe far north than in middle Europe, but this was something quite beyond the calculation of the migratory birds. They came at their regular time, but perished by hundreds of hunger and cold, especially in Denmark and Germany. The spring of 1868 was unusually mild and early, the snow had disappeared from our southern lowlands as early as March; but the greater part of the migratory birds did not make their appearance that year till after the usual time.

We shall now in a few words point out the order in which our best known migratory birds come and go. As a rule it is the case that the species which are the last to go in autumn are the first to come back in spring, and *vice versâ*. But this does not seem to depend on the longer or shorter distance which the different migrants perform, and some, which disappear early in autumn, may spend the winter in southern Europe, while others which remain here longer, betake themselves as far as the tropical parts of Africa.

With the first southerly winds, which sweep over the snow-covered fields and frozen lakes of Scandinavia, come a lark or two as harbingers of the still distant spring. Even in the end of January can sometimes be seen this our earliest migrant seeking its miserable food on the roads along with its friends the yellow hammers; more come in the course of February, but it is not till the beginning of March that they begin to show themselves in larger numbers, and by the close of the month their songs resound over all the fields, which now begin to be brown.

About the middle of March the jackdaws pass over us in flocks, and let their peculiar short cry of "yak, yak" be heard. In the end of the month come single blackbirds, linnets, chaffinches, and greenfinches, and peewits and oyster-catchers to the west coast.

In the beginning of April the thrush-like strophes of the redbreast are heard from our gardens and groves, the starlings revisit their breeding boxes* of the year before, and salute their birth-place with their queer hurdy-gurdy-like notes ; the kestrel begins its attacks on the small birds, which however take very little notice of it ; in the still leafless groves the redwing raises her loud song, with which a flock of bramblings combine their piercing love-notes ; the missel-thrush with its abrupt melodious notes welcomes the spring, and the hedge accentor insinuates itself silently among the bushes and thickets. In the edges of the woods sit the proud ringdoves, making their excursions to the fallows, and soon all the hill-sides re-echo in the clear spring evenings with the full choir of the song-thrushes, with which a migrating woodcock mingles his short sharp love-note which never fails to electrify the sportsman who hears it. Soon the well-known twitter of the wagtail resounds from every roof, and now come the hen chaffinches, who are received with joyful song by the expectant cocks.

In the middle of April there is a short pause in the arrival of the migrants. Different species of duck, which have wintered by the edge of the ice, now show themselves along the shore, the ring-ousel jerks its tail from the thickest copse, and the wheatear from its stone, the stock-dove coos, and from the top of a spruce-fir the chiff-chaff repeats incessantly its song of "chip chap," "chip chap," to all who will listen.

In the close of April the black-headed buntings flock into the copse woods, the meadow pipit utters its whistling "st, st," in its peculiar hopping kind of flight, and high over our heads resounds the shrill scream of the looms while they fly in pairs up to their fishing lakes in the mountain forests. The close flocks of chaffinches are kept in constant alarm by the hovering hobby and merlin, the buzzard sends its melancholy cry down from the height, the golden plovers, the curlews and other waders show themselves in flocks on our fields and coasts. Great flocks of grey geese migrate every day over our heads, and in the last days of the month comes the cock redstart, who at once and unceasingly lets his clear notes be heard from our groves and gardens.

Most of our migrants come in the first half of May. Then the wryneck first lets us hear his uniform pipe, and the trill of the tree pipit, the modest songs of the whinchat and the ortolan resound on the fields, wherever one turns. The black and white flycatcher has already taken possession of his last year's hole, and sits patiently at the entrance waiting for his mate, who does not come till some days later. Various songsters are already singing with their full throats, and the earliest swallows fly over the fields.

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* It is a common practice in some parts of the north of Europe to set up breeding boxes on and near the houses for starlings and other birds to breed in.

First, in the middle of May, when the trees are in the act of springing into leaf, the cuckoo is heard, and sings unweariedly in forest and grove her well known notes: the swifts hunt, whistling in the warm spring air. The yellow wagtails and the sandpipers let themselves be heard, while the spotted flycatcher moves, silent and still, as always, among the boughs. The garden warbler and the lesser whitethroat unite with the other warblers, and the sociable sand martins resort to their breeding places in the steep sandhills. Unweariedly the corncrake utters his crake all night long and much of the day to boot, and on the open hill sides the nightjar is actively engaged in his pursuit of the swarming moths.

There are not many now left behind. In the latter end of May comes the red-backed shrike, which sets about nest building the very day after its arrival, the yellow breasted warbler * and the quail. This last is spreading more and more over the country and their easily distinguishable notes are heard in most of our lowland clover meadows.

In autumn the birds depart in nearly but not quite the contrary order. Even as early as the end of July or the beginning of August the old cuckoos leave us, while the young remain on till September. Some fine evening in August the swifts break up, as do the yellow breasted warbler, the quail and the red-backed shrike. In the first half of September several warblers, and also the lesser and the greater whitethroat, besides the ortolan, wryneck, yellow wagtail, sand martin and nightjar, the terns and some of the snipes. About the middle of September depart the swallows, the redstart, flycatchers, wheatear and whinchat, the corncrake, tree-pipit, golden plover, curlews and others. In the end of September we see the last garden warblers, and willow wrens, the small falconidæ and other birds of prey depart, and the flocks of grey geese are often seen flying to the southward. In the beginning of October go the white wagtail, the meadow pipit and the doves: in the middle of the same month some of the hardy warblers, as the chiff-chaff, blackcap, redbreast hedge accentor, and now at last disappear the linnets, the hen chaffinches, starlings, woodcocks, blackheaded bunting, looms, and most of the larks: and at the close of October we say farewell to our latest migrants, viz. the thrushes, cock chaffinches, the brambling, the jackdaws and the last larks. Even up to the first days of November can one see an odd wagtail or two, a blackbird, woodcock or ringdove, besides jackdaws and single finches which even spend the winter with us, but these are stragglers, and almost always look sickly or crippled.

It is a very rare thing for any of the regular migrants to winter in the east part of Norway. But on the west coast every now and then one comes

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* Not British.

across wagtails, redbreasts, blackbirds, redwings, woodcocks, starlings, and various ducks.

But after the migrants leave us in autumn, those of our stationary birds that pass the summer in the forests come near to the inhabited places, the roving birds make their appearance, and contribute with our constant residents to prevent our groves and gardens appearing quite lifeless. The titmice come forth from the forests in flocks, and constantly have in their company tree creepers, golden crested wrens, common wrens, and nuthatches. The nutcrackers, which in summer are almost unseen, hover silently near the houses, the woodpeckers visit our gardens, and the bullfinch searches the mountain ashes by the road sides. The goshawk, and its smaller but more active cousin the sparrow hawk reappear after their hidden robber-life during the summer in the forests, and the water ousel ducks and wades, swims and runs by the edges of our rivers and open running waters. The capercaillie and blackcock begin also to bestir themselves, and often fly to the adjacent birch copses to reach the dainty birch catkins; the willow grouse come down from the high mountains, but not so far down as to the bottom of the valleys, and the rare partridge seeks a refuge from the snow and cold by the barns, where however it but seldom enjoys the hospitality it seeks, but is pretty sure to fall a sacrifice to men or animals.

And last of all come those of our high northern species which look upon our lowlands as their south, and take up their winter quarters with us just like true migrants. The high Fjeld sends us the twittering snow bunting, and the countless swarms of the lesser redpole, which like flakes of snow descend upon our fields; one single shrike (*lanius excubitor*), a bird indispensable to the ancient falcon catchers, looks out from the top of a tree, and takes by surprise an unfortunate titmouse, which lays down its life in the claws of this bold pseudo falcon. And, if the year is favourable, the waxwings and hawfinches come down from their northern summer home, enliven the bare trees with their brilliant colours, and are caught in numbers in our snares baited with the enticing berries of the mountain ash.

It remains to speak of the different ways in which the birds travel. All roving birds, and such as only move short distances at a time, move only by day, but the true migrants move by night as often as by day, some for nearly the whole twenty four hours. Some wander singly, some in pairs, some again in large companies, some migrate each sex by itself, as the flycatchers, the chaffinches and many warblers, the cocks departing later in autumn, and returning earlier in spring, than the hens. And it is probable that this is the case with many more species than we at present know.

Every one has seen how the swallows before their departure collect in flocks of many hundred individuals, which rest on the cornices of high buildings, telegraph wires, or among the bullrushes and reeds of fresh water lakes ; one fine evening they all break up at a given signal, fly for a time round and round upwards to gain a height, and thereupon vanish in the distance. The starlings in the same way collect, before their departure, in flocks which particularly on our West coasts must attain an incredible size. These birds also have the strange custom, as soon as the young can fly, of leaving their breeding place and spending the rest of the summer in company with crows or other birds near the sea, and again collecting towards the time of their departure. This sudden disappearance in the middle of summer is especially observable in the eastern parts of the country, at a distance from the sea, and in the whole of the diocese of Hamar* it is quite difficult to find a starling after St. John's Day.

In the case of some birds, particularly wild geese, cranes, and sometimes wild ducks, individuals take up, as they migrate, a fixed position as regards the rest, flying in an acute angle, open behind. But what is the reason of this? It is not easy to decide, and the explanation usually given, namely, that the flock can in the form of a wedge more easily cut through the air does not seem to deserve to be entertained. It is scarcely probable that the cleaving of the air column can be continued along the whole range from the very point of the angle to the individual bird which forms the last joint in the side of the angle. The distance between each goose as it flies is at the very least four feet. It is more probable that the great caution of these birds suggests to them during their flight to take the formation in which, as far as possible, without getting in one another's way, they can see all around them.

But the form of this angle changes incessantly during their flight. Now some change places, one going out, while the other takes its place, now the whole line wavers, now the angle is more acute, now more obtuse, some times the apex disappears entirely, and the formation becomes nearly that of a straight line. Now a little division leaves the main line, and forms a smaller "Annex," but always angular, between the lines of the larger. Sometimes the whole flock come to a halt in the air, yet without coming down, and fly one round the other with quick strokes of the wings, but soon they begin to fall in again, by degrees each one takes its former place, and the whole flock again continues its march.

The proceedings of the jackdaws during their migration are very peculiar. For the most part they fly high up and straight forward, but suddenly one, with closed wings, falls to the ground, the rest follow one after the other, and in less than a minute the whole company has come down to hardly an hundred feet above the earth. Then by degrees they rise again, attain their former height, and begin the old game over again. The same flying performances may sometimes be seen in the common crow.*

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* East of the Great Mjosen lake, North of Christiania.

The smaller species of the birds which migrate in flocks, as the swallows, fly in no particular order, but yet in more or less compact bodies. Every now and then they approach the earth and catch an insect or two, but it is only when the weather is decidedly bad that they rest during their journey.

Besides the regular nocturnal birds, and especially the owls and the nightjar, all the bad fliers migrate by night. Such are the ortolan, the black-headed bunting, the quail, the moorhen, and corncrake, snipes, and ducks, some thrushes, and a large number of the warblers. Often can one hear their love notes through the darkness from above, and so ascertain the species. Thus the greenshank and sanderling usually let their cry be heard in the dark September nights. They mostly spend the day in seeking food, and the sleep they allow themselves during their journey seems to be inconsiderable.

All the stronger species, which are exposed to persecution, as well as all the good fliers, migrate only by day, or, as the larks, during the whole twenty-four hours. These rest by night, and also during the hours immediately after noon.

Bad weather often postpones the migration for a time, and then they are obliged to beguile their time as best they can during their detention. But contrary winds are not to birds what they are to us, for they rather assist than hinder their flight. If they have the wind aft they move irregularly, and are often blown out of their course, but if the wind is ahead their feathers are closed against their bodies and the bird can better pierce the air. Bright days and light calm nights are the best for them, but if they encounter a fog they often lose their course entirely, and go astray to places in which they have no home. The Fauna of every country can show many such individuals.

Some migrants do not reach their goal exclusively by the help of their wings. Many of our ducks swim long distances down the rivers of central Europe, and the heavily flying quails and corncrakes perform no inconsiderable distances running. One has constantly come across such wandering quails and corncrakes, but how are such birds, who fly as badly as any of our home birds, capable of crossing the wide Mediterranean, and of pressing far down into the Tropics? In the course of a journey to Egypt in 1849, Prof. Esmark observed a flock of quails lying and resting on the water in the middle of the Mediterranean. No bird, dead or alive, sinks, and none need, like quadrupeds, to make any movement with their feet or wings to enable them to float. The air-filled bone-system and large lungs of birds are enough for this, and it is probable that some others of the bad fliers have recourse in their weariness to an element which is nevertheless unnatural to them.

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* I suppose the hooded crow, which is very common. I never saw our common carrion crow in Norway.

The birds go away silently and as it were with sorrow, and their parting is quiet and unmarked; with joy and song they come back, and lose no time in making themselves known to all and every one. Their desire to return is so violent as often to carry them far beyond the boundaries of their proper home. Thus in spring we are regularly visited by species belonging to southern and central Europe, which however seldom stay with us, but disappear as fast as they came. Thus the stork is a regular spring visitant to the south-eastern parts of Norway, and has been known to go as far as to Bergen and Christiania, in flocks of as many as twenty and more. But our country is not the stork's home, and even if a few individuals have survived the murderous reception that awaits them everywhere from thoughtless men, who shoot at every one that shows itself, they have never been able to remain with us, and have not bred. Many can be mentioned of such far-straying species, we will mention only the hawfinch, the kingfisher, the roller, the ibis, the avocet, the black stork, the spoonbill, and the pochard.

Individuals may sometimes show themselves in quite a different part of the world to that to which the species belongs. This may be accounted for partly by storms, fogs, or other natural phenomena. Thus we are acquainted with a not inconsiderable number of North American species, the well-known passenger pigeon for instance, which have been shot in Western Europe. But for other cases there is no accounting; an occurrence of this kind can we also mention from our own land. In April, 1834, a species of albatross *(Diomedea culminata)* that does not ever show itself north of the Equator, was killed upon the ice at Fiskumvand in Eker *; this specimen is to be found set up in the museum of the University, in the collection of Norwegian birds.

All migrants seem to hasten their movements more in spring than in autumn, and it seems as if they longed to see the place again in which their cradle stood. And that at least a large number return every year not only to the same district, but to the very same place which they lived in the year before and in former years, we have innumerable proofs. In our own country the observations on this point, like many others, are still few in number; the last which has come to the knowledge of the author of these lines shall be mentioned. Of our common wagtail there is a variety with a coal-black back, which is common in England, but has been observed only exceptionally with us. In the summer of 1867 one of these black-backed wagtails (its scientific name is *Motacilla Yarrellii*) dwelt here at Christiania at the place called Meyerlökke; last year (1868) it appeared again at the same place, remained the whole summer, and will hardly miss coming next year, if it lives.

This is easy enough to observe in the case of swallows, starlings, and others, which use the same nest year after year. The very day after the house martins' arrival they take their old nests into possession, fly in and out, and look for all the world as if they had never gone away. But what puts the question beyond all doubt are the many observations which have been made (*e.g.* in Sweden) in the case of the birds which have been for a time kept in captivity, and then set free again, such as wild geese. These have in many instances year after year faithfully returned to the place where they have been brought up, have recognized the people who were about them, have gone straight to their old feeding trough, and have remained all the summer through; but when autumn comes, they listen to the call from the south, to come back again the next year.

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* On the (now alas! ruined) [illegible], 250 English miles south of Drontheim.

But how this is is to us inexplicable. It is one mystery added to the many others which mark the active life of birds, and one which will scarcely ever be explained. Hitherto all we know is, that it is so.

CHAPTER VI.—LIFE IN THE SOUTH.

Where do our migratory birds pass the winter? They leave us for the south, and come back again from the south. But how far their migration goes is what we know with certainty only concerning a few species. Many lose themselves in the misty distance, without any one's knowing where they stop. This is the case with the swallows, which are known by every child as they fly, free from care, about our fields and houses, and which seem to us so homeish that it must follow as a matter of course that we know their lives from first to last. There is something so mysterious in the disappearance of the swallows as to make it intelligible that the belief ever existed that they spent the winter torpid at the bottom of the sea among reeds and rushes, although this was flatly contradicted by the whole of their organization. That swallows migrated to Africa has long been known, but then Africa is twice as long as Europe. The same is true of the cuckoo and many warblers.

Many migrants go to no great distance, but the winter abode of others includes a great extent of country. In the European coasts of the Mediterranean a great many of our predacious birds spend the winter, *e.g.*, the buzzards, the osprey, the peregrine, the hobby, and also the chaffinches, the linnet, ortolan, and redbreast, all our migratory thrushes, the starling, the hedge sparrow, the doves, a wagtail or two, the golden plovers and others of the same family, the woodcock and other scolopacidæ, various other waders, and the greater part of our migratory ducks.

Besides a large number of those already mentioned the following birds winter in North Africa:—the merlin, many swifts, one or two of the flycatchers, the pied and yellow wagtail, the blue-throated warbler (our mountain nightingale), the redstart, the wheatear, the willow warbler, the turtle dove, a great many of the waders, and some of the swimming birds.

The following birds press down quite into the tropics, possibly beyond the Equator:—the kestrel, the nightjar, all the swallows, the cuckoo, the two flycatchers, the tree pipit, the shrike, a number of wagtails and wheatears, the lesser whitethroat, the yellow-breasted warbler, the quail, the crane, the landrail, and sundry other more accidental visitors.

Every migratory bird has the advantage over men of being able at once to find themselves "all right" in the place to which they wander, and of finding themselves at home everywhere. The cuckoo searches for hairy caterpillars with the same eagerness among the mimosa groves of the hot interior of Africa, as in our northern forests; the black swift sweeps indifferently the eternal pyramids of Egypt and our homely Church-roofs; the omnipresent wheatear devours with the same satisfaction the tropical insects which it discovers on the relics of antiquity which lie scattered on the Libyan desert, and the scanty supplies of flies and gnats which it catches on our high Fjeld upon the stones which stand out above the stunted willows on the edge of the perpetual snow; the peregrine rests his weary wings with as complete security on the palm-tops of the oases as on the outskirts of our spruce forests; and the wild-duck ploughs the waves of the Nile with the same dignity as the still forest lakes at home.

They all make at once for the place which corresponds to their dwelling-place with us. The predacious birds descend upon the forests, the swallows push on to opener places, the cuckoo, the flycatchers, and the shrike keep to the copses or the primitive forest, the larks and tree pipits run about the fields, the meadow pipits find out swampy meadows, the yellow wagtails the mountain becks, the pied wagtails the inhabited places; the warblers, thrushes, and doves spread about the copses and forests, the starlings fall upon the cultivated land, the cranes by the river sides, and the waders and swimmers in the marshes and lakes.

Egypt is the migrants promised land, and in fact here most of our northern birds of passage are found collected. Here all varities of country are concentrated, lofty hills which gradually pass into flowery, wooded, or inhabited plains, smiling meadows alternating with the burning sandy desert and the most luxuriant primitive forest, the mighty Nile, with its innumerable canals, the coasts of the Mediterranean, and the Delta with its lakes and marshes. And the number of birds which build and live in Egypt are nothing in comparison to the countless swarms which come in autumn to pass the winter; the number of these according to travellers, borders on the incredible, and it almost seems as if this was the rendezvous of all the birds in the world.

As soon as the cuckoo and the swift have brought the first message of Autumn from the north, the country soon begins to be filled. One after the other the winged winter guests crowd in, singly, in pairs, in flocks large enough to darken the sun. The lakes are literally covered with water fowl in masses two miles across, in forest and thicket living creatures swarm in every bush, by the edges of the waters the waders stand in ranks miles in length, and every sandbank, every island is covered with sea fowl in hundreds and thousands.

This common life lasts the whole winter. But the spring sun gradually disperses the flocks, and some begin to get ready for a move at the very beginning of February; in March those species arrive which have wintered in latitudes still farther south, and in the beginning of April the last of the northern guests have vanished.

The south of Europe cannot indeed offer such favourable places of resort for the travelling bird-world as Egypt, but a by no means inconsiderable number of our northern migrants are collected here, and winter on the slopes of the mountainous parts of Spain and of Italy which are free from snow.

On these slopes, clothed with an evergreen belt of oak, elm, and chesnut, alternating with the thickest brushwood, with waters and rivers, thousands of our commonest migrants winter. Our common redbreast is here so numerous in winter as to be found in nearly every bush; chaffinches and thrushes, especially blackbirds and ring ouzels, crowd into the forests, golden plovers, peewits, and other waders betake themselves to rest by the rivers and marshes. But how are they welcomed here, these migrants of ours, which are found here only as guests, in search of shelter from winter, intending, as soon as the sun permits, to make their way back again to their true home. In the most cruel and shameful manner are they all persecuted, great and small. Millions of harmless swallows, warblers, and other small birds lose their lives for the sake of the morsel of flesh that is found on their tiny little bodies, or else have to spend the rest of their lives in captivity. Behind every tree lurks the fowler, in every bush is found a snare, on every field a limed twig. Labourers and artizans, citizens of good condition, and worldly priests, leave their work and turn out to catch small birds, and thousands of able bodied men are occupied the whole year round in this degrading way. This murder is carried on in Switzerland and Italy to its greatest extent, but Spain and Greece are not very much better.

Thus they encounter no little danger in their migration. The moment they have crossed the Alps and have come down upon the smiling land of Italy destruction lurks for them behind every bush, and if they succeed in escaping this also, thousands of them, wearied, are swallowed up in the Mediterranean.

The bird has at last reached its distant goal, and apparently begins its new life without care. But it is not its true life. It can never repress its longing after home, and during the whole of its expatriation it is deprived of the real happiness of life. Therefore they are all silent, none lets its voice be heard as when at home. Nearly all the species crowd together, even those that at other times live separate, as if they sought comfort in one another's society. Many of them are moulting, and this, which always gives birds a sickly appearance, does not tend to enliven their spirits.

Not a single migrant breeds a second time in its winter quarters, not one builds a nest. They all impatiently wait for their journey home, and when the time for this is near, their spirits rise again, a new life flows through them, and they begin to sing. And so one fine spring morning they again tread upon the spot where they first saw the light, and where their first song was heard, all of them clothed in their holiday dress, all jubilant with happiness and full of confidence for the future.

And when they come thus, larks and starlings, wagtails and swallows, cuckoos and all the rest of them, who is there, whether young or old, rich or poor, who does not feel the spring stirring in his heart, and a sense of happiness and thankfulness at his capacity for enjoying all the goodness and beauty of nature? Therefore spare these children of nature that so trustfully settle among us to gladden us with their song and to draw us to them with their innocence, spare them, not only because they can be of service to us, but because they, like ourselves, fill a place in Creation which men may not disturb wantonly nor without reason. Invite them to dwell among us, give them secure homes in which to lay and hatch their eggs, protect them from all disturbance from both men and animals, and let them find the quiet and security which they seek among us. And to all, especially the young, who, either from thoughtlessness, or an unprofitable love of collecting, search for and take the nests and their eggs, to all these is addressed the earnest and sincere prayer

SPARE THE LITTLE BIRDS AND THEIR EGGS.

MEETING HELD MAY 20TH, 1870.

THE following donations were announced, and thanks ordered to be given to the Donors:

A collection of fossils from the Isle of Wight, by F. Storr, Esq.,
Echinus from Maestricht, by C. R. Carr, Esq.
Scaup Duck, shot at Mildenhall, by Rev. C. Soames.
Snipe (*Scolopax gallinago*), by J. H. Garland.
Indian Basket and Shells, by F. D. How.
Mosquito Brush, by H. S. Sankey.
Journal of the Linnæan Society, and Miller's "Footprints of the Creator," by F. E. Hulme, Esq., F.L.S.
The "Terraces of Norway," by A. S. Marshall-Hall.

The Heads of Sections gave their Reports.

C. A. Sladen exhibited a series of varieties of birds' eggs.

The Rev. J. Sowerby read the following paper on

THE DISCOVERY OF CRYSTALS IN THE ALPS.

THE name crystal is applied by the learned to all mineral substances which assume a regular shape, whether they are opaque or transparent. The popular idea would, probably, only admit the name to be properly applied to the latter. I should think that, in some way or other, every one was familiar with the appearance of crystals as popularly understood, and whether we regard their symmetry of form, their beauty of colour, or transparency, we must admit that they are among the most admirable productions of nature. There are certain general forms to which all cystals may be referred; to name or describe these is at present needless, and would, perhaps, be unintelligible; they may be seen in the Museum by any one who cares to look: but, besides, there are very many varieties of these forms; the number of new minerals which have been discovered of late years is very great, and every one of these has its peculiar form and colour of crystal so definite that the skilled mineralogist will at once, upon examination of the crystal, pronounce to what mineral it belonged. Some examples of these are as follows:—The crystals of iron pyrites and of fluor spar are both cubes, i.e., they are like dice, the former opaque, the latter transparent; quartz, or rock crystal, and common ice, have their crystals in the form of a six-sided prism, often terminated by a pyramid; the crystals of carbonate of lime very much resemble the head of a nail, and those of calcite resemble quartz, except that the point is much sharper; the angles at which the planes meet forming an essential distinction. The mode of formation of these crystals is, to a great extent, a matter of conjecture.

There is little doubt that many, if not all, of the crystals found amongst the igneous rocks, must have been formed when these rocks were cooling down from a state of fusion : but, as crystals occur in many formations which have never been subject to heat, they must have been deposited in cavities when the fluid which filled them disappeared by gentle evaporation or otherwise, and again it seems certain that crystallisation takes place even in solid substances. Actual observation of these processes in nature is of course impossible, or almost so : geologists and chemists have been led to these general conclusions partly by observation, but chiefly by experiments on the fusion or solution of substances, and their subsequent restoration to the crystalline state. Many substances can be dissolved in warm water, and crystals are deposited as the solution cools : the same may be done with cold water, but the process is slower, and less complete, as the substance is less completely dissolved. In the case of a fused metal, the exterior portion hardens first ; after a short time this crust is broken through, and the remaining liquid poured off, when a network of crystals is obtained on the interior of the cavity ; or the substance may be vaporized, and crystals are deposited on condensation. The process of crystallization in solid bodies is less readily illustrated. I believe it is a well-known fact that the metal in large masses of iron, as railway axles, has a tendency to crystallise, which has sometimes produced dangerous accidents. The only other instance I know is as follows : large masses of pounded flint and lime are mixed carefully together for the manufacture of porcelain ; it has been found that if the mixed mass be left unused for a considerable time, that the particles of flint shewed a tendency to agglomerate and form nodules ; exemplifying the way in which ironstone has gathered together in the clay, or possibly, even the flints in the chalk. Quartz, or rock crystal as it is called, if not the most common of all, is perhaps most frequently met with. It is one of the many forms which siliceous earth assumes, and wherever this is present quartz crystals will also be found. Thus they appear in the flints in the chalk, though of small size, and even in the cavities of the chalk itself. I have seen portions of the cliff at Lulworth Cove larger than my outspread hand, covered with small crystals, from the size of a pea to a pin's head. They are, however, much larger in the older rocks ; and in mountain districts, either in this country or elsewhere. In the Alps, particularly, they occur of great size and beauty, and it is of their occurrence there that I must now speak more particularly. I suppose there is hardly any tourist, in Switzerland, that has not found the pleasure of his visit enhanced by the finding of crystals. On the moraine of the glacier, on the long slope of shiver on the mountain side, with what pleasure have we greeted the glitter that betrayed their presence, broken though they were, and defaced by frequent pressure against rock or ice. How depressed have we felt after a fruitless search for them, when others returned with their pockets filled with the pretty six-sided prisms. Fewer, again, are those who have seen them almost *in situ*: who, on some high arete, have found the glittering fragments strewn in profusion, just released from their birthplace by the last winter's frost, with points and surfaces smooth and uninjured. When I was with Mr. Adams on the Bristenstock, in 1863, at a point on the arete, about 9,000 feet above the sea, we found a space of several square yards, covered with pieces, though not of large size. There were 50 or 60 about the size of my fist. After gloating over them, we selected 10 or 12 of the best and carried them down to Amsteg in triumph. The next year, in the ascent of the Ritzlihorn, in the Urbach Thal, about an hour from the top, we were attracted by a crack in the rocks, running in the direction of the strata. On closer examination a dull green light seemed to illuminate the inside, and the word 'Crystal Hole' was muttered by the guide. We wasted half-an-hour at the spot, in vain attempts, which only resulted in a few fragments, and the breaking of an old friend, my alpenstock. The guide no doubt marked the spot, and returned there provided with better means to make his way in.

The patient crystal-hunter whom we meet occasionally, often a bent old man with a pick over his shoulder, may seldom have had a find worth more than a few shillings: the bright spot in his life may probably be that day, so memorable to him, when he got 50 lbs. weight out of one hole, and realized 150 francs (£6) for them. But he has a dream which is ever urging him on to fresh exertions, a dream of the many great grottos in the bowels of the mountains, of which so few are found; he may be lucky enough to find one of them, and then be a made man for life. The great discoveries of which there is any historical record, are very few in number. They seem to be confined chiefly to the central mass of the St. Gotthard, and the branches diverging from it. In 1719, a peasant, of Guttannen, named Geissholz, found a grotto in the Zinkenstock, by the Lauteraar glacier. The entrance was 3 feet in diameter, the dimensions of the interior, 120 feet long and 18 wide; out of this an enormous quantity of crystals was taken. Geissholz at first kept the knowledge of it a secret, and accumulated money by the sale of many large pieces, and was accused of sorcery by those who envied his fortune. The total weight of crystals was estimated at 100,000 lbs., the value 30,000 florins (£3,000). Many pieces were over 100 lbs.; several between 4 and 5 cwt., and one reached 8 cwt. These particulars are given by Dr. Kappeler, of Luzern, who visited and examined the spot. His account differs, in several points, from that of Scheuchzer, who writes, in a letter to Sloane, that the weight of some was 1½ cwt., the value from 4 florins to 1½ Louis d'or per lb. The largest and dearest was 2 feet 9 inches long, 3 feet 7½ inches in circumference, and weighing 2½ cwt. This, with several others, is in the museum at Berne. Ebel again says that the greatest is in the Paris museum, 3½ feet diameter, 2½ feet in length, one of its six faces being 1½ feet across, and of the purest water. The fact, however, is undoubted of the finding of the grotto, and an enormous quantity of crystals.

In 1757, some magnificent pieces were taken out of a grotto in the Viesch Thal, weighing, respectively, 50, 600, 800, and 1,400 lbs. (!) Two of the largest were sent in 1799, (the period of the French occupation), to the museum at Paris.

Between 1770-1780, 5,000 lbs. of crystals were got out of a grotto, in the hill of Hegdorn, above Naters, near the Aletsch glacier, amongst which were some ranging from 700 to 1400 lbs.

The fact that so few of these great pieces are found in collections, is probably due to ignorance of their existence, and the demand for the article, particularly in Milan, for the purpose of ornamental manufacture.

For nearly 90 years no other notable find took place. The next and latest brings us to 1867. In the summer of that year Herr Lindt and his brother, accompanied by Peter and Andreas Sulzer of Guttannen, crossed the Tiefen Sattel, a depression in the ridge N. of the Galenstock. Whilst resting on the Tiefen Glacier below they observed on the cliff of the Gletschhorn a band of quartz 50 or 60 feet long and varying in width from a few inches to 10 or 12 feet. At one part of this about 100 feet above the glacier, several dark spots were visible between the quartz and granite. These the keen eyes of the guides discerned to be holes and they asserted confidently that crystals must be there. The weather changing for the worse and the late hour of the day prevented any attempt at examination. It was indeed doubtful whether it was possible to reach the spot. A fortnight later the two Sulzers came again, and Andreas, a daring climber, succeeded in getting up, but a storm prevented any sufficient inspection and they returned empty handed.

In the summer of 1868 the work was resumed by Andreas Sulzer with three other men of Guttannen, and in August the first large piece of 15 lbs. weight was got out. Others came to help and with renewed spirits they set to work to enlarge the entrance of a second hole of some 8 or 9 inches aperture. It was no easy matter to use the mallet and boring iron on the narrow granite ledge. Through the long night the wind howled round them, threatening to whirl them from the rocks: hail and rain chilled their limbs in their scanty summer clothing. Half despairing of safety they clung to each other, unable to warm themselves by exercise, without any sufficient supply of stimulating drink or nourishing food. Less hardy natures would have succumbed, but perseverance carried them through. They worked incessantly from Saturday till Monday, and after two unsuccessful blasts, the third shot exploded inwards and enlarged the opening sufficiently to give entrance to a grotto of considerable size. This was filled almost to the roof with an earthy chlorite-like rubbish mixed with pieces of quartz and granite. On the top of the rubbish lay a flat white layer of granite which obviously had fallen in large plates from the top. After enough of the earth had been cleared out to admit of their creeping in, by stirring and digging about they soon came upon crystals of smoky quartz (Rauch-topas). These lay loosely and irregularly, some with their points up, others down, in all positions. Some were magnificent cabinet specimens, in all respects perfect, others damaged probably by falling from the roof, others imperfectly developed. All were of an intensely dark colour, belonging to the variety much esteemed in the trade, and known as the Morio. The mirror-like brightness of the surfaces was remarkable, resembling coal black polished marble. The crystals were almost all separate; many of considerable weight. There were more than 50 between 1—200 lbs., nearly 20 over 200 lbs. and two over 300 lbs. The whole was estimated at from 25—30000 lbs. These weights did not rival those of earlier discoveries. The find was however undoubtedly the greatest for a century, and for smoky quartz it was unique.

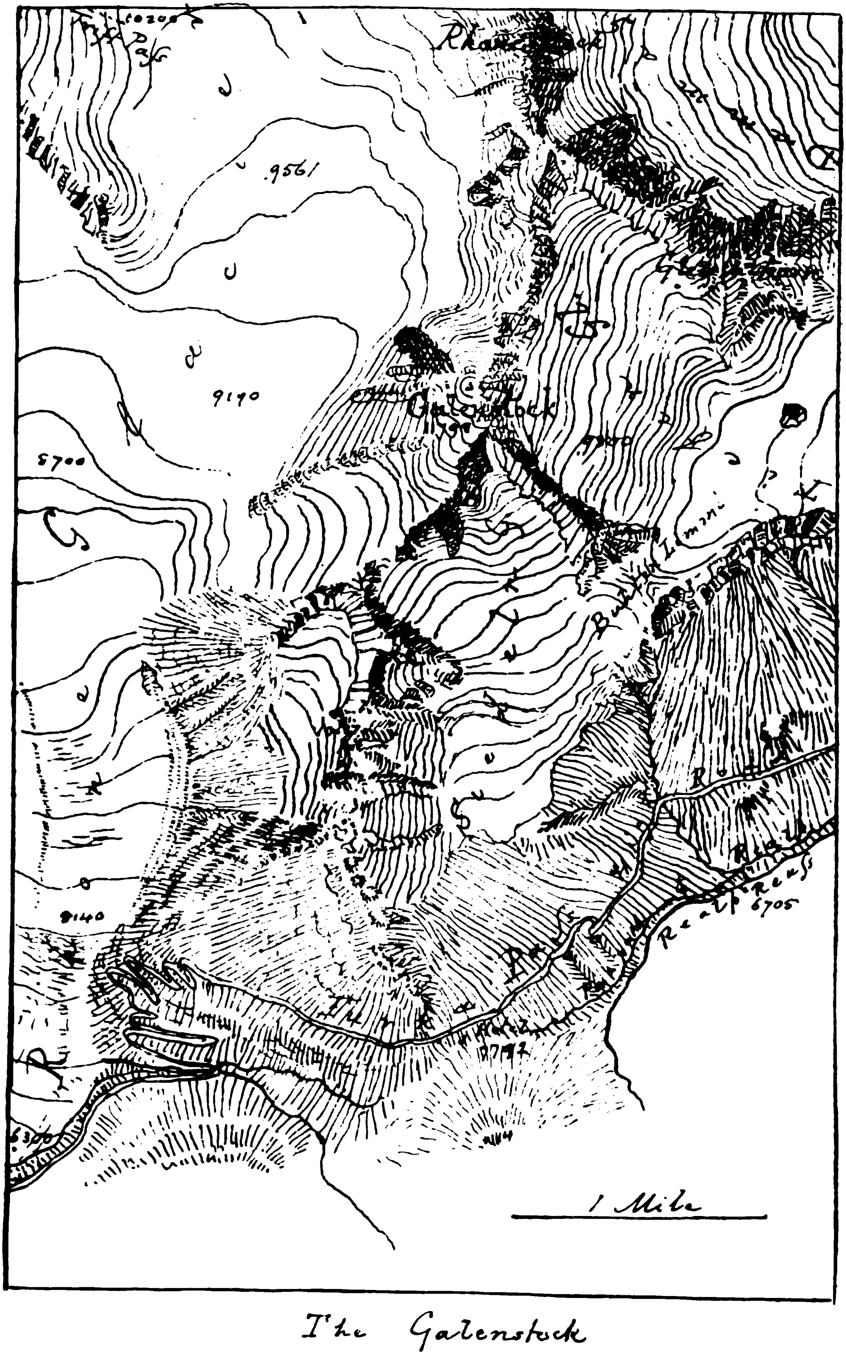
The news of this spread like wildfire and after the first 10 men had got out some 20 cwt., the whole able-bodied population of Guttannen, some 70 strong, was at the spot. Within a week the place was so completely cleared out, that Herr Lindt himself could with some trouble find a piece as big as his fist. The smaller pieces were thrown down on the glacier: the larger pieces, at least whilst they worked carefully, were secured in bags, and lowered down with a guiding rope to keep them from striking the rock. Loads of 100 lbs. weight were carried in baskets on men's backs, the larger pieces on sledges over the crevassed Tiefen glacier, and down the steep slopes of grass and rock to the upper house of refuge on the Furka road. Thence they were removed by the landlord of the Grimsel to Oberwald in Wallis. A report soon arose that the people of the Urseren Thal meant to stop the passage by the Furka, and levy a heavy toll upon them. To avoid this route more than 1500 lbs. were carried over the Buhlenlimmi, the Sielden and Rhone glaciers, and the Nagelis Gratli to the Grimsel. The dread of interruption made the work of clearing out proceed with feverish haste. Hardly an eye was closed in sleep; the dangerous transport continued night and day. It was a wonder that no life was lost; one man, heavily laden, fell into a crevasse to a depth of 50 feet, but was fortunately able to extricate himself without material injury; another nearly slipped through an ill-made knot when being drawn up to the hole.

At last came an order from the authorities of Canton Uri, to stop those pieces yet remaining within its limits. Three large pieces were thus detained, one weighing 267 lbs. Whatever justice the claim thus made may have had, it was certainly unjust for the Canton to sell its rights to a private person. It made over its claims to Herr Sebastian Müller, the landlord of the

Furka Inn, for 1300 francs. He used his power unscrupulously, and besides detaining the pieces mentioned above he extorted from the men of Guttannen 8,500 francs, (£340) a sum the more exorbitant as the value of the crystals fell far short of the first estimate.

Herr Lindt found the approach to the holes difficult. The glacier at the foot of the cliff forms a great curling ridge, down which you must approach the foot of the rock, and then make your way to the hole over ledges and projections a few inches in width. It was no easy business: only the best and boldest climbers could get up unassisted. Two places in particular required skill and surefootedness. The first was a perpendicular slab of granite quite smooth and so high that a tall man could just get his fingers over the upper edge; there was not room for two to stand at the foot and so by this slight hold only the first man must raise himself up. Shorter and weaker visitors had the aid of the rope, which has enabled many an indifferent climber to pass a spot he would never have thought of facing without it. The next difficulty was the passing of a round projecting knob of granite which required very great exertions and much power of sticking: the first man had to hang backwards over the precipice below almost like a fly on a ceiling: a rope was then stretched round the rock for a balustrade, whilst the followers had also the security of another rope round the waist. Even with these aids it required a smart exertion of strength to get round without losing hold. To add to Herr Lindt's discomfort, the weather was bad at the time, the rocks were fringed with icicles; every now and then a violent blast swept up over them the loose snow from the glaciers, which melted again on them and on the rocks in wet of icy coldness; they were all glad to reach the hole, their fingers were so benumbed as to be almost useless. Andreas led the way into the largest of the three openings, creeping in feet first. It was only 2 feet broad by 1½ feet high. The floor of the cave is several feet below the entrance, and is perfectly dry, though if water by any means found entrance, it could not flow out again. The height at the entrance 6 feet, diminishing to 2 or 3 at the farther end, length 18 feet and breadth 15 feet; one night 19 workmen slept (?) in it. The limit between the quartz and granite was plainly visible. No bases or roots of crystals were observed on the roof, so that most of them must have been attached to it and have fallen when the stone was disintegrated by the action of the air. Two large masses of lead ore (Bleiglanz) were found, covered with a crust of Laumontite. Sulpho-carbonate of lead was also found on the ore, and oxyde of lead was discovered in several places.

The heaviest of the Morio crystals weighed 267 lbs. Its length was 2½ feet, with a diameter of 18 inches, and it was beautifully formed. Three of the surfaces of the pyramid were, as usual, alternately greater than the other three. The change from pyramid to prism was not sharply defined on the



The Galenstock
and its
surrounding Glaciers

lower part, so that the crystal there assumed a rounded bulging shape. The base was pure transparent quartz, gradually passing into smoky quartz and the colour was most intense at the point. The lower part of the smoky quartz was mottled with transparent spots, the upper with dark cloudy ones. The planes of the prisms were marked by straight lines parallel to the base like rings of growth: the faces of the pyramid displayed a mirror like brightness and the finest polish. This, with 10 others ranging from 255 lbs. to 125 lbs., have been placed in the Museum at Berne. In the village of Oberwald were 10 others from 200 lbs. to 64 lbs. Two of these were perfect, and the rest though slightly damaged were well fitted for collections. Here also were the two largest weighing each above 300 lbs. but with broken points and covered with chlorite.

A private firm and others had at Oberwald and Guttannen from 60 to 70 pieces over 30 lbs., and 30 others between 3 and 30 lbs.

The remainder which amounted to nearly 18,000 lbs. was only fit for the cutter and polisher.

The discoverers were first of all disposed to set an extravagant value upon the crystals, and this difficulty rendered almost all dealing impossible. But when experts assured them that the best were not worth so much, and that much was of little value even to the manufacturer, they came down to more reasonable terms, 7 francs a lb. for good pieces, and 2—4 francs a lb. for broken ones.

This discovery has made the village of Guttannen for a time the envy of its neighbours. Many bickerings have unfortunately arisen amongst themselves, from the difficulty of adjusting the claims of the discoverers and their assistants to the crystals and the profits of them. It is to be hoped however that in the end the benefits will be great; and that many of the families will find their comforts and happiness largely increased. Those who have seen the village, with its patches of cultivated land separated by heaps of stones, scantily planted with potatoes or cabbage, and have observed on that desolate region the struggle which man has to carry on with nature will not be envious, but rather thank the Providence which has granted such a piece of good fortune to so poor a section of the human family.

W. D. Fenning was elected Secretary, and J. B. Fuller on the Committee, in the place of G. E. Manisty, who had left the School. F. E. Hulme, Esq., F.L.S., was elected an Honorary Member.

There were 32 persons present—3 Honorary Members, 15 Members, and 14 Visitors.

MEETING HELD JUNE 3RD, 1870.

The minutes of the previous meeting were read and confirmed.

Geology.—H. C. Spry presented two very fine quartz crystals.

Archæology.—H. C. Spry presented two Idols from a temple in Birmah. When passing through Allahabad the larger one (of wood) was worshipped by the natives. Similar idols are frequently filled with jewels, though this appears to consist of a solid block of wood.

Entomology.—J. B. Fuller passed round a list of notices since the last meeting.

Ornithology.—E. L. Hesketh passed round a list of notices, including that of the black-headed bunting (*Emberiza schœniclus*). The President exhibited a specimen of the Lesser Spotted Woodpecker (*Picus minor*), captured in Savernake Forest, and of the Wheatear (*Saxicola Œnanthe*) picked up on Totterdown, March 28, 1870, by Mr. Coleman. Also a hen's egg with two yolks. Mr. Parker had shortly before met with a double hen's egg, having one complete egg with a hard shell inside another with a soft shell.

Botany.—The President announced the discovery of four plants, new to the College List, and exhibited a specimen of Gulf-weed (*Sargassum bacciferum*), a lump of prepared figs from the Caucasus, and the fruit of some palm picked up after a storm near Madagascar.

H. R. Armstrong mentioned having seen the shoots of a briar growing down to the bottom of a pond 4 feet deep, and there taking root and sprouting under water.

Library.—The receipt of the usual periodicals was announced; also the donation of the Journal of the Linnæan Society, by F. E. Hulme, Esq., F.L.S., and of the 3rd Report of the Rugby School Natural History Society, by the Society.

J. B. Fuller read the following paper on

ROMAN REMAINS OF SILCHESTER.

The Roman town of Silchester, or as it was then called, Calleva, is situated on the ancient London road, near Reading. It was not originally founded by the Romans, but was by them taken from the Attrebutes, a Belgic tribe, of whom it was the chief city. The walls enclose an area forming an irregular pentagon in shape, and about 3 miles in circuit. They are composed of 7 bands of masonry, each 3 feet deep, thus forming a wall 21 feet in height, and are about 7 feet thick. Indications of a British fosse are to be seen outside, and there were also some Roman earthworks immediately within the walls. From this it will be seen, that, on the capture of the town by the Romans, they built a wall inside the ancient British fosse, which was left untouched. Its capture took place very early in the occupation of Britain by the Romans, probably from its being an excellent place for signalling to Southampton, which was then the "Portus Magnus," by beacon.

Through the town from north to south ran the road from the north of Britain to Winchester, which branched off to Old Sarum shortly after leaving the south gate. The road between London and Bath through Corinium cut this at right angles, and in one of the angles formed by the intersection stood the forum.

The site of Calleva has been known for some time, but it is only within the last five or six years that the excavations have been regularly begun.

The ruins were discovered on land belonging to the Duke of Wellington, who, with the assistance of Mr. Joyce, to whose great abilities as an antiquary the success of the investigations is in great measure owing, has prosecuted the discoveries with great spirit. The excavations form five groups, two of which, being of an unimportant nature compared to the others, have been filled up again. Of the three others, the first is a large private house situated on the east side of the Winchester or north road in an angle which a smaller street makes with it.

It consists of an atrium opening into a large central hall, round 3 sides of which there run passages, which separate it from the smaller rooms. In it was discovered a small hypocaust, in which some remains of the small tile pillars, which supported the pavement of the room above, were found. There was also a second hypocaust in connection with, and receiving its heat from, the first, which warmed the triclinium or dining room. In it the heat was conducted under the floor, by a series of paved channels, running from the centre to the sides of the room, and then leading by flues up inside the walls. One of the earthenware flue pipes can still be seen in its place.

Behind these hypocausts there was the furnace which heated them, and a small room, in all probability the apartment of the slave, whose duty it was to attend to the fires. In this a broken strigil was found. In another room, probably a sleeping apartment, the lock, hinges, and iron bindings of a strong box were found. From their position it is almost certain that the box to which they belonged was, for security, imbedded in the floor; possibly the owner of the house slept over it.

Most of the rooms were paved with little earthenware bricks about 1 inch cube in size. In the passages these were sometimes of two colours, red and purple, arranged so as to form three alternate bands of each colour, running down the passage. In some places the pavement has been mended with large paving tiles, evidently at a later date, when the manufacture of the smaller tiles had become either unknown or disused. A few more rooms, which appear to have been added some time after the house was first built, are entirely paved with these large tiles, some octagonal, and some square in shape. A small bit of tesselated pavement, about 3 feet square, much injured by the plough, in consequence of being very near the surface, was the only thing of note found in this house.

The second house, or block, as it is called, was situated in an angle formed by the Winchester road and a minor street, which ran out from it, 15 feet in breadth. It was an exceedingly large one and must have belonged to one of the principal officers of the town. Another proof of its importance is given by the fact of its being situated so near the forum, as both stood on the north road not quite 120 yards apart. This house is most interesting, not only from its size, but also from its shewing with great distinctness the alterations which it received at different intervals from the time, in which the town was first conquered, to the evacuation of Britain by the Romans; for on careful examination remains of older walls were found underlying the upper ones, and afterwards it became plain that beneath the surface of the same area there lay the lines of no less than 4 different houses, built one above the other in succession. The date of each could be roughly determined by the coinage found on each level. Of course this could not be considered as an infallible guide, because coins continued to circulate some time after the death of the Emperor, in whose name they were issued, but it might be an index which would greatly help us to determine the date of each erection. From this it appeared that the lewest and oldest building was of the reign of Claudius the First, or Domitian, the second structure was made by erasing some of the lines of the galleries, and was probably of the time of Commodus. At this time some very important features of the house were introduced. A very curious hypocaust to warm a sitting room 20 feet square, and two pretty good pieces of tesselated pavement, one of which was removed in a very perfect state to the hall of the Duke's residence at Stratfieldsaye. The other had been very much injured by the plough.

The third rebuilding of the house can be easily distinguished from the fact, that in it the new structure, though retaining the position of many of the rooms in the older house, was altered in its relation to the cardinal points, being shifted round a few feet at the North West angle, so that the lines of the two houses were not square with each other. This alteration was probably of the time of Claudius Gothicus, a great number of his coins and of his predecessors being found there.

In the fourth and last state of the house, the walls were built in a manner very inferior to those in the preceding ones, being merely composed of courses of flints set in black mud, mortar having been used in the other ones. In this structure six large rooms were built facing the North road, and, from their size and similarity to those at Pompeii, they may be with justice considered to be shops let by the wealthy owner of the house to tradesmen.

In one of these rooms a tile work base of something was discovered, which from its shape may have been the furnace of an artizan.

The date of these alterations may have been about the end of the reign of Diocletian, perhaps near the time when Constantius Chlorus came over to Britain to quell the revolt of Allectus.—A most distinct proof of the different alterations in this house is that, when, in the second structure, a hypocaust was built, the anteroom to the triclinium, which it warmed, was built over one of the old walls. When by the lapse of time the pavement of the room sunk, it remained at its original level, where it was supported by the underlying wall, there being thus a ridge running throughout the floor. In one of the hypocausts, for there were two in this house, the connection between the flues and the furnace was effected by an arch of tiles, the greater part of which still remains.

In general shape this house differs from those at Pompeii in having no atrium, a change from the usual form of Roman houses, which was probably effected by the climate, for a hall open in the centre of the roof, as an atrium was, would admit of too much ventilation in the rooms and galleries to be agreeable. The length of the house along its principal front, facing the North road, is 150 feet, along the other side, facing the minor street, 110 feet.

This house is connected with the forum by the Winchester or North road. At the Southwest corner of the forum, in the angle formed by the junction of the North and London roads, probably stood a precinct with the altar of the Segontiac Hercules, the dedicatory inscription of which was found there about the middle of last century. It was an oblong stone tablet set in brass. Running up the west side of the forum was an ambulatory or penthouse, roofed with large bluish coloured tiles. On the inner side of the ambulatory were a series of large rooms which are supposed to have been public offices of some sort or other. The floor level of one of them is much higher than that of the others, and is apsidal instead of rectangular in shape. It was probably the chamber in which the Decurion, by which the affairs of most of the smaller towns were transacted, held their sittings.

Another, from a leaden seal, such as were then attached to records, having been found there, is called the record office.

In all of these rooms the floors were covered with charcoal, which proves that this part of the town at least had been burnt down. In the room which stood at the head of the ambulatory a bronze of beautiful execution was found imbedded in the charcoal. It was a Roman eagle, with its vertical wings torn off, 9 inches long. By a careful comparison of this most curious relic with the sculptures on Trajan's pillar, and from the strict mode in treating the bird, both with regard to its plumage, and its proportionate relation to the size of the human body as observed in the sculptures of the Aquilifers or standard bearers of the Legions, it appears more than probable that this is indeed a veritable legionary eagle, with its staff and vertical wings torn off in some desperate struggle, and then hid in the beams of the house, which accounts for its having been found in the midst of the heap of charcoal, with which this and a great many other rooms was partially filled.

Adjoining these offices, at the southwest corner of the forum, the Basilica or law-court stands. This building was in earlier Roman times merely a roof supported on two rows of pillars, and therefore because it was quite exposed to the atmosphere Vitruvius directs that it should be placed at the warmest corner of the forum. But as the Romans became more civilised and therefore more effeminate, a wall was substituted for the pillars, which were only retained inside, or if any still remained outside, they were only used to decorate the Pronaos or entrance.

It was therefore divided into three aisles by these two rows of pillars, which also were used to support galleries for spectators over the two side aisles. At one end there was a raised place divided off from the rest of the court, in which the curule chair was placed, and round which the judices, who sometimes amounted to 180 in number, sat. On each side of this tribunal there were generally small chambers for the judices, called Chalcidica.

Later, when the Basilicæ, instead of being merely law-courts, came to have more of the properties of corn exchanges, the tribunal was thrown out of the terminal wall, generally in the shape of an apse, so as to seclude the judices more from the noise and confusion in the body of the Basilica.

You must have all noticed from the description I have just given, that the general shape and arrangement of our modern churches is almost entirely taken from the Roman Basilicæ, some of which indeed were converted into churches at the time when Christianity began to spread throughout the Roman Empire.

The Basilica of Silchester, although it has the later introduction of the external walls, yet keeps to the old custom in being situated at the warmest corner of the forum. It also has the external or apsidal tribunal. The chord of the semicircle is 26 feet across, and the apsidal wall is four feet six inches thick. On each side of the tribunal are the chambers or Chalcidica: one of which, however, is very much larger than the other. In front of the tribune stood the Bema, a Grecian introduction, from which the orators addressed the people. It was fronted with thin slabs of Purbeck marble, portions of which were still found adhering to it. Indications of the two rows of columns can be still traced, one row, however, being much plainer than the other, which has almost entirely disappeared. The other end originally terminated in an apse, remains of which can be seen underlying the later walls, but it was at a later date made rectangular.

Eastwards from the Basilica there extends a series of rooms alternately square and apsidal in shape. They were probably public offices of some kind or other.

The forum is bounded on the other two sides by ambulatories within the tabernæ or shops. In one of these a deep hole, thought to be a well, was found.

The forum itself, that is the open centre area and the buildings with which it is immediately surrounded, forms a rectangular mass not quite square. Its two longer sides are 319 feet in length, its two shorter, 275 feet.

There was an entrance into the open area, which was used as a market place, about the middle of each side.

The most remarkable relics found here besides what have been already noticed, were, a glass cup very much resembling in shape a common tumbler, but of very thin glass, which was found in a very perfect state in the forum, a great many locks, keys, hinges, and also some bracelets and rings. On some of the building tiles and rougher sorts of pottery, there were impressions of dog's feet, caused by the animals walking over them before they were baked.

The coinage varies from Vespasian, A.D. 70, to Honorius, A.D. 393. A few of the reign of Augustus were found, which, however, could hardly have been in circulation at the time. On the reverse of some of the later coins, those of Magentius among others, the christian symbol "XP" with the Greek letters "A" and "Ω" on each side of it, was stamped.

A great many different kinds of pottery were found, some beautifully marked Samian ware among others. This ware is a very compact glazed red pottery, and it was at that time the best kind made.

I must now conclude by saying that for the most part I owe this paper to the kind help of Mr. Joyce, and to the lecture which he gave on the subject before the Society of Antiquaries last year. I must also hope that you will excuse any archæological inaccuracies that have been made, on the score of my ignorance of that branch of natural science, which I should never have chosen for the subject of my paper to-night, had not circumstances afforded me such ample opportunities for investigating the relics of that interesting Roman colony,—Silchester.

The President then read part of Chapter iv. of Mr. Penrose's paper on "Bird Life."

There were 41 persons present, 2 Honorary Members, 17 Members, 1 Medius Socius, and 21 Visitors.

MEETING HELD JUNE 17TH, 1870.

THE minutes of the previous meeting were read and confirmed.

Archæology.—E. L. Hesketh presented to the Society some fine specimens of Samian ware from Smithfield, and some curiously coloured glass from the bed of the Thames.

Botany.—The President announced the discovery of about eight plants new to the College List.

F. E. Hulme, Esq., exhibited a leaf of the common nettle (*Urtica diocia*), the stalk of which was covered by a fungus and had thereby lost all its power of stinging.

Entomology.—J. B. Fuller passed round a list of notices recorded since the last meeting, and exhibited a specimen of the rare *Acentropus niveus*, captured on the canal at Wilcot.

C. A. Sladen exhibited a specimen of *Sirex Gigas* captured at Martinsell.

Geology.—E. Almack exhibited some fossil bones from the drift of the Thames near Hurley, and made some remarks on the best mode of preserving such specimens.

Ornithology.—E. L. Hesketh read out a list of notices and exhibited a remarkable nest of the Reed Warbler (*Salicaria arundinacea*), presented by H. T. King, and a minute hen's egg presented by S. W. Featherstone.

H. S. Sankey presented the ordinary dress of a South Australian woman.

W. D. Fenning read the following Paper written by F. Giles, Esq., a former member of the Society, on

SOME FUNDAMENTAL PHYSICAL IDEAS.

THE object of Physics is usually said to be the investigation of the properties of bodies and the actions they exercise at great distances, and this is the simplest general definition. But to attempt a strict definition of a science is at once to become unintelligible, for a science cannot be defined by some marked characteristic as can a material object or a geometrical figure. In beginning the study of Physics therefore it is better to attain clear and accurate ideas of the objects with which the science has to do, than to strive after obscure definitions of its aim.

And first then what do we mean by space? We can very easily grasp lengths and distances. A length of one yard or of twelve yards is perfectly familiar to us, and we can as easily conceive the distance separating us from a point on the horizon, or even that which cuts us off from the sun or the stars. Similarly we can master areas, such as the surface of a lake or of the sea, and volumes, of a cubic foot of marble for instance, of a house or a mountain. Imagine then a cubic foot of marble suspended in a quantity of water; now if we take it away the water of course instantly fills up the place originally occupied by the marble; but suppose the water to be kept out in some way, or rather suppose the cube of marble abolished so that only its six faces are left to keep out the water. This volume where there is neither marble, water, nor anything else is *space*, it is the space formerly occupied by the cubic foot of marble, and we now suppose it destitute of all matter. What applies to one cubic foot of marble applies equally to larger volumes. We may imagine a mountain annihilated from its base to its topmost peak, and the mind may still preserve an idea of its volume or of the space which it occupied. In the same way it requires no greater mental effort to conceive the volume of the earth than to master the volume of a marble or a cannon ball.

Above our heads is the atmosphere and above the atmosphere is the void of heaven. Into these regions also our minds may soar and weary themselves by searching it in all directions; they will meet with bodies analogous to the earth but separated by vast tracts of space. The vault of heaven is purely an illusion, and possessed of no solidity, but were it hard as adamant it could offer no check to the intellect which would plumb its very depths and traverse space beyond the stars; its range is limitless; it embraces infinite distance and has glimmerings of something yet more grand. Thus we apprehend infinite space and as a consequence space is actually infinite.

It is often said that man derives the ideas of succession and *time* from the contemplation of the phenomena of nature. Thus spring succeeds to winter and day to night, giving him the idea of succession; he may see time represented in the continuous flow of a river or the ceaseless tides of the ocean. But there is no need for any external phenomenon or any action on our senses to inspire us with the idea of time : we think and are conscious of our thoughts, they follow each other, and at once we have succession and continuity. No doubt this internal action does not enable us to count the hours, the days, or the years ; but the possession of the idea of time and the possession of the means of measuring it are two very different things. All external motion might be suspended, the stars might stop in their courses, the clouds become motionless, the flow of water cease, and in the midst of the universal repose we should still know that time was divisible although we should no longer possess the means of dividing it.

The ideas of space and time permeate all our perceptions, chaos, an absolute void is inconceivable to us, or rather when we try to imagine it we only imagine space and time.

The idea of space is complete and perfect in itself, that is to say we can conceive space and nothing in that space ; but it is not an exclusive idea forbidding association with any other. In space we can conceive *impenetrability* and impenetrability is *matter*. It is wrong to say that matter is gifted with two essential properties, extension and impenetrability, they are not properties but a definition. Impenetrability once conceived is simply called matter. We can picture to ourselves limited or infinite space, and similarly we can understand limited or infinite impenetrability, it may occupy a small volume like a drop of water or a volume as immense as the globe. Here we come upon another fundamental idea : we may imagine the impenetrability continuous and inseparable, or discontinuous and consequently separable. Inseparable penetrability is called an *atom*. The idea of greater or less magnitude has no effect on the conception of an atom any more than the idea of form ; we may conceive a very small or a very large atom ; we may conceive it round, square, pointed, or in any other strange form the imagination can invent. Only we must not suppose the whole world to be one great atom, nor matter to be all of one piece ; for the earth and the moon are two fragments of matter separated from each other, and we see matter on the earth's surface disintegrate and fall asunder, proving from our very definition that the earth is not an atom. Beyond this experience alone can guide us ; and all experience leads to the conclusion that matter is not indefinitely separable, but consists of portions of a size far below the appreciation of our senses which are absolutely inseparable, and are therefore true atoms. Recent discoveries seem to offer overwhelming proof of this and the view is now exclusively adopted.

A collection of atoms is called a *body*. In general bodies are of greater or less volume according as they contain a greater or less number of atoms ;

they are of different appearances if their component atoms are differently arranged; a still more marked difference exists where the atoms are of varying shape and size, and finally they are essentially unlike when their atoms are perfectly distinct.

In a given volume of a body, a ball of gold for example, we do not suppose all the atoms to be arranged alike, and all equally distant from each other; but we are led to imagine several atoms so grouped as to form a *molecule* or *particle*, and the grouping of the molecules in their turn imparts its structure and entirety to the body. Thus there is a greater distance between two molecules than between their component atoms. This is the sense strictly attaching to the words *molecules* and *particles*, which are almost synonymous; but they are sometimes used in another sense as in speaking of the vibration of the molecules of a sonorous body, or of their expansion under heat; we do not then refer strictly to each particular group of atoms, but loosely to small portions into which we mentally divide the body. By a similar misuse the word molecules is applied to the smallest fragments of a broken body.

The immense variety of bodies which come under our observation may all be divided into three classes; they are either *solids* like the rocks, the metals or the organic tissues; *liquids* as mercury, water, spirits of wine, or the animal fluids; or *gases* such as the air we breathe. Liquids and gases are sometimes grouped under the common name of *fluids*. It is worthy of remark that one and the same body may be at one time a solid as ice, at another a liquid as water, and finally a gas as steam. Changes such as these familiarize us with the idea that bodies are merely collections or congeries of atoms separated from each other by greater or less distances, and capable of acting in concert and communicating pressure or motion without touching each other.

Atoms merely placed side by side could not constitute either solid or any other bodies; they would only result in an incoherent mass like a heap of sand or dust. Now a stone or a piece of iron is a solid resisting body; there must, therefore, be something which holds the atoms together, which attaches them to each other and retains them in their places. Bodies would at once disintegrate if they consisted of atoms in simple juxtaposition, or rather no body could exist. All would be dust. We may imagine any atom in a piece of iron pressed against its neighbours, just as a block of stone is pressed against the ground; a certain effort is necessary to raise the stone; and could we seize the atom it would require a greater or less effort to tear it away. The *causes* of these *pressures* or *mutual actions* which the different portions of matter exercise on each other are *forces*.

Thus there are forces acting on the atoms of iron, which press them against each other, retain them in their places, and give to the whole mass the fixity we find in it.

Similarly, there are forces acting on the molecules of all solid bodies, giving them a determinate structure within and without, a permanent form. As there is no body destitute of a certain dependence between its parts, we conclude that wherever atoms approach each other mutual action is always set up by means of which they attract each other and assume a determinate structure.

Liquids, in spite of their mobility, have the same dependence between their parts: a drop of water has always a shape peculiar to itself whether seen on an ordinary surface, or deposited as dew on the foliage, or again suspended from the extremities of bodies. The form it takes results from the action of its component molecules, for without mutual action these molecules would instantly separate and fall away.

Air, invisible and subtle as it is, is no exception to this general law. It is impenetrable, for it offers resistance when enclosed in a bladder, a balloon, or any other receiver. Hence it too is composed of atoms and molecules; and its different parts exercise a mutual action on each other: from thousands of phenomena which prove this take only that of respiration which is patent to us all. The external air enters the lungs just in proportion as the chest opens to receive it; thus the molecules without act on the molecules within, they press on them and force them back, and when the air is enclosed in the chest, the molecules within react on each other and fill it out, just as they act on each other to fill the whole capacity of a receiver however great its size.

These forces continually acting within bodies between neighbouring molecules or between the atoms contained in a molecule are called *molecular forces* or *molecular attractions*; they would be better named *molecular actions* or *atomic forces*, or perhaps the *constructive forces of bodies* since these forces really give to bodies their peculiar constructions and appearances.

But there are other forces besides molecular forces playing an active part in nature; bodies fall when dropped, rivers flow ceaselessly, the sun appears to revolve round the earth; these *motions* we observe, and our minds could conceive matter to *exist* had these motions never been produced. They are but accidental *effects* due to determinate causes. These causes of the displacement of bodies or *motions of translation* are also called *forces* or *powers*. They are no doubt connected with molecular forces, which can indeed in some cases impress motions of translation; but they are usually kept apart from them.

There are two things essential to be considered in motion: its direction and its slowness or rapidity. If the moving body pursues a straight course the motion is *rectilinear*, and the straight course pursued by the moving body is the direction of the motion; if, on the other hand, the body pursues any curve whatever the motion is curvilinear, and the curve pursued is the direction of the motion. But in this last case if we wish to express its direction at any instant, it must be remembered that between any two points on a curve an infinite number of tangents, or straight lines, touching the curve, may be drawn; the moving body then being at one and the same time on the curve and on a tangent, the direction of its motion is said to be along the tangent on which it lies. Thus, in curvilinear motion, the moving body is perpetually changing direction, and if it describes a complete circle, it has actually passed through all the directions possible in one plane. As to the slowness or rapidity of the motion, in mechanics as in ordinary language, motion is said to be slower when the moving body traverses less space in the same time, and more rapid when it traverses a greater space. Care must be taken, however, to ascertain whether the motion which is less rapid measured by the space traversed in a given second for instance, may not be more rapid with reference to the space traversed in an hour or a day; for one and the same motion may slacken or increase in rapidity in a long duration of time.

Absolute motion and absolute rest are purely mental conceptions: in the universe nothing is absolute to us, all is relative and conditional. Thus all the substances on the surface of the earth which appear most absolutely motionless to us are but enjoying relative repose. Trees are at rest in connection with mountains, and mountains are at rest in connection with the soil and the whole mass of the globe; but trees and mountains are carried round with us in the vast orbit of our planet, and with us traverse in a second ten times the space traversed in the same time by a ball hurled from a cannon. Yet, though we traverse space thus rapidly we can form no estimate of our absolute motion, we must first ascertain whether the sun is motionless in the centre of the heavenly system. Now, all investigation seems to shew that the sun carries the planets with it just as the earth carries with it its atmosphere and its clouds, its trees and its mountains. The sun itself is but an invisible planet compared with another sun round which it circles, and this other sun is no doubt also whirled round in space, so that we cannot point out or even imagine any fixed centre round which all these revolutions take place.

We may conceive the forces acting on inorganic matter in two lights. We may suppose them endowed with a separate existence independent of matter; or we may admit them to be inherent in matter itself, mere permanent properties given to it when it came into being. These two hypotheses come in the end to one and the same thing; but whatever idea we may adopt as to the origin of forces and their mode of existence, they, with matter, are controlled by two fundamental principles witnessed to by all the phenomena nature is perpetually offering in frequent recurrence or long continued duration to our observation. These two principles constitute what is called the *inertia* of matter. The first is—if all the forces acting on matter cease at a given instant, the matter preserves its state of rest or motion. The second is that all forces are governed by immutable laws. It results from the first principle that an atom of matter can neither acquire motion to itself nor change that which it has already received; and if two atoms of matter communicate motion to each other by their attractions or mutual action of any kind, the motion for instance communicated to a stone, unsupported by the hand, by the earth's attraction, it results from the second principle that such motion will be produced according to a determinate law which has suffered no change from the beginning of things. Thus whatever changes matter under undergoes whether in its condition, in its state of rest or its motion we must attribute to special causes or forces: sometimes to new forces which suddenly come into action; sometimes to permament forces, which continue to act, and are regulated in their action under the control of immutable laws. Whether a body is shattered or displaced, whether it hardens or softens, whether it cools or grows warm, whether it is liquified or vaporised, each and every change is due to the impression of a definite cause. No stone ever breaks of its own accord, or lifts itself from the ground; it has never become hard or soft, cold or hot, liquid or vapour, of its own agency. Cut the string which sustains it and it falls with ever increasing rapidity. A cause is necessary to induce its fall and the same cause continuing to act hastens its motion by repeating the effect. The earth as it revolves round the sun experiences perpetual changes: at one time its course is slower, at another more rapid, yet nothing is accidental in the periods of change, nothing is fortuitous or unforeseen. The same cause always governs the motion, but it varies in energy, and the law of this variation maintains the equilibrium of the universe.

The further then we investigate the phenomena of nature the more do we become impressed by their subjection to *law*. We regard chance as an impossibility, for we see that all is Cosmos, beautiful order. No reflection is better calculated to inspire man with a true appreciation of his own utter insignificance, while at the same time none is more likely to fill him with love for the supreme Being Who takes such fatherly care of the least of his creatures.

H. Manders resigned. Captain H. O. Bateman, 43rd Regiment, was elected an Honorary Member, and S. C. V. Filleul, W. J. Gardner, and H. O. Yeatman, were elected Ordinary Members.

There were 42 persons present: 3 Honorary Members, 16 Members, 1 Medius Socius, and 22 Visitors.

MEETING HELD July 1st, 1870.

J. B. Fuller passed round a list of entomological notices obtained since the last meeting, and exhibited a pair of the Japanese Silk-worm Moth (*Bombyx Cecropia*).

The President exhibited a large box of Brazilian moths.

G. C. Mansel presented a typical nest of the Reed Warbler (*Sylvia arundinacea*).

E. Almack announced the presentation to the Society, by Dr. Fergus, of Simonin's "Underground Life," translated by Bristowe, for which a special vote of thanks was passed.

E. L. Hesketh read a paper on "Wasps."

There were 30 persons present, 1 Hon. Member, 16 Members, 1 Medius Socius, and 12 Visitors.

MEETING HELD July 15th, 1870.

The Minutes of the last meeting were read and confirmed.

The President made a few remarks on the state of the Society's funds, and also noticed the want of energy in the Society.

J. B. Fuller passed round a list of Entomological notices obtained since the last meeting, including the capture of the Currant Clearwing Moth (*Trochilium Tipuliformis*) by Mr. W. Coleman.

E. L. Hesketh exhibited a fine specimen of the nest of the Willow Warbler (*Sylvia trochilus*) presented by A. C. Almack, Esq., a former Member of the Society.

The receipt of the usual periodicals was announced. The President read part of Chap. V. of "Bird Life."

There were 38 persons present, 1 Honorary Member, 13 Members, 1 Medius Socius, and 23 Visitors.

MEETING HELD JULY 22ND, 1870.

The minutes of the preceding meeting were read and confirmed.

The heads of sections gave their reports for the half-year.

The President exhibited a large-sized Water Beetle (*Dytiscus Marginalis*), and some eggs of the common Grass Snake (*Natrix torquatus*), and made some remarks on the subject.

Also a case containing mounted specimens of the Gold and Silver Pheasants, presented to the Society by Mr. Gauntlett, head keeper of Savernake Forest.

A. M. Bell, Esq., then read the following paper on

A DAY IN THE HIGHLANDS.

If the members of the Natural History Society expect any vast increase to their knowledge from the pages which I am about to read, I would advise them at once either to crush such hopes or at once to retire and bury themselves, deep as plummet can sound, in the histories of Thuanus, or the modest volumes of Coevier. I profess but little knowledge of the juvenescent buds of the *Pinguicula*: the monstrosities of *Poa alpina* have no interest for me: my acquaintance with beetles, I own it with more shame than regret, is but small, and I think I can tell more about the habits of Kittywakes and Tommy Norries than of *Fuligulæ* and *Thalassidromæ*. What I propose to do is to give some account of the scenery among the Aberdeenshire hills, with a few words it may be of the people to be met there, natives of course, not metics or aliens, with remarks interspersed on Alpine botany, which even to a superficial observer presents much worthy of interest. I know well enough that a constant habit of only roughly observing is not to be commended. I would quote in deep approbation the words of Sir Thomas Brown, Knight, of Norwich: "The wisdom of God receives small honour from those vulgar heads that rudely stare about, and with a gross rusticity admire his works; those highly magnifie him, whose judicious enquiry into his Acts, and deliberate research into his Creatures, return the duty of a devout and learned admiration." Still what I propose to do may not be without use to those among us who are juniors: to be able to distinguish between the Lady fern and the Alpine Polypody is I think as fruitful to habits of observation as to reason subtly on subjunctive and optative with or without ἄν; and there are moments of reflection which tell us that to have walked five and twenty miles with one's eyes open is as sure a source of pleasure, for all true pleasure is creative, as to have used those same sharp organs to score five and twenty runs at cricket.

However, without further preface, will the members of the Natural History Society kindly suppose themselves in the Castleton of Braemar. This town is so called from a castle or garrison set there in 1747, to prevent further commotion in the Highlands, for the men of Mar went out, as the saying was, for the old line of kings, as a great part of them still hold out for the older religion. It is a romantic conservation which gives these tribes their imaginative character and a wider sympathy than would be expected from men living in so lonely wastes, just as it is the prosaic side of the same conservation which makes them loll on the grass while their wives cut the corn, and see their children starve while the seas beside them are brimful of fish ready to be caught. This same Castleton also has been sung of by an English poet. At Castleton, says Clough, high in Braemar, are the clippingest places for bathing, a pre-eminence, which if my hearers follow me so far, ought to be granted to Rothiemurchus on Spaeside. The river in which Clough and his companions bathed is the Dee; the readers of Guy Mannering will remember

Or are they the links of Forth, she said,
Or are they the birks of Dee.

Indeed the birks or birch-woods of Dee are unsurpassed, and those whose minds rally round the court may bethink them of Balmoral some twelve miles down the river from the Castleton. But in this same Castleton we are delaying a most unconscionable time, and we have a considerable journey before us. On the opposite side of the river is a range of vast hills, the tops of each streaked in the lines of the rising streams with white snow, though it is now July of 1868, the hottest summer known in these parts since the '26, "and that was na so hot nather," an old man assured us, "of whom more anon, anon, sir." Ben Muich Dhui, the highest, broadest, massiest, and most distant to view of these peaks, we propose to climb, and then descend the other side of the range to the valley of the Spey. Our party consists of four; an Indian Captain who still feels his old freshness at the scent of the heather; his wife, the best and pluckiest of hill climbers, and a veteran member of the Apine Club who is familiar with more peaks and passes in the Alps and Pyrenees, than either I or I fancy the most of my hearers. We therefore, since we have full forty miles before us (and I hope the Natural History Society will not disdain to join me) start very prudently at 8.30 in the morning in a hired vehicle to take us to the foot of the hill. The road goes up the valley of the Dee and is overshadowed by forests of birch and Scotch-fir: the white bark and sweet smell of the one and the red bark and gnarled, wind-twisted, boles of the other are characteristic features of Highland scenery, nowhere found to greater advantage than in the valleys of

Braemar. In this twelve miles drive we pass a stream which has been described by Clough in the passage beginning:—

"There is a stream. I name not its name lest inquisitive tourist
Hunt it and make it a lion, and put it at last into guidebooks.
Springing far off from a loch unexplored in the folds of great mountains
Falling two miles through rowan and stunted alder, enveloped
Then for four more in a forest of pine where broad and ample
Spreads to convey it the glen with heathery slopes on both sides;"

and so on; I do not name the stream either partly because Clough tells us not, and partly because I don't know the name.

Two miles beyond this stream we passed the Linn of Dee

" where over rocks between rocks
Freed from prison the river comes pouring, rolling, rushing,
Then at a sudden descent goes sliding, gliding unbroken,
Falling, sliding, gliding in narrow space collected,
Save for a ripple at last, a sheeted descent unbroken,
Where to the element they offered their bodies down-shooting the fall, and
Mingled themselves with the flood and the force of imperious water."

So did not we, however, but drove on to the foot of the hill, where two ponies and two guides awaited us. The name of our eldest guide was Charles Stewart, a Roman Catholic, and for 300 years he told us his forefathers had lived where he lives now; the name of the other was Johnny Faa whose black face, names, and something of a merry wit spoke another than Celtic origin. The ponies also deserve a word of commendation; though slow they were sagacious. The ascent of Ben Muich Dhui is long and slow; we first go for near five miles up a valley called Glen Lui in which there is little ascent: the lower reaches of the valley are filled with magnificent Scotch firs, as on Deeside, under which I searched with great pains for the *Linnæa* which I make no doubt grows there, but was unable to find. It is a beautiful trailing plant with trumpeted flowers of light colour; Linnaeus gave as his reason that this plant should bear his name that it was a little northern plant, long overlooked, depressed and flowering early; but I make no doubt also that it is commoner in the forests of Sweden than in those of Scotland, and would vividly recall to Linné in his somewhat forlorn life in Paris and elsewhere the scenes of his boyhood and his father, the gardener's home. The upper part of Glen Lui is covered with the ruins of many houses; we also picked up a fine deer's horn which was lying in the grass. Of the policy which depopulated these valleys when there was no longer a prospect of a civil war to use men, and gave them over to sheep and deer, I do not mean to say a word. Scripture to be sure does say that a man is better than a sheep; the English aristocracy however, of whom we are all justly proud, say quite the contrary.

However let us hasten out of this valley of Glen Lui lest we plunge into the mires of contention, and like Joseph's brethren fall out by the way. After five miles of the glen are five miles of ascent before the top of the hill is reached. A steep climb of near 1000 feet brings us into the heart of the hill; there is now before us a deep blue tarn or lochan, as they are called in these parts, on the opposite side overhung by high rocks and encircled by bare and more or less steep hill sides of granite rocks. These tarns are common among the Cairngorm hills and have usually the same name Loch na neain, expressing their name, the loch of the shadows. It would seem now that we had passed the region of vegetation. It is not like one of the Perthshire Hills, Ben Ledi or Ben Lomond where you can climb on turf to the top. We are not near the region of vegetation. Our path is no longer on grass, heather or common rush. It is over granite stones or crumbled granite sand: the interstices are filled with soft dry moss, *sphagnum* or *hypnum* I believe. In the waters of the lake I saw the bell-shaped Lobelia peering above the surface, and doubtless at the bottom might have been found the *Isoetes* and perhaps the *Pilularia*. Above ground the commonest plant is the *Juncus trifidus*, a rush very rare except among the Breadalbane hills; it is a slender and beautiful plant. Green plots are also formed by the *Azalea procumbens*, a small and shrubby plant with pink flowers. There are also a good number of willows: many of my hearers I do not doubt picture to themselves stately trees drooping over the tarn we are passing, which notion is far from correct. The powers of winter, frost, and wind, which force as I have said the primeval granite to crumble away, hardly suffer any plant to rise above the ground. The willows I speak of are about three inches high, and very beautiful they are climbing over the rocks with green netted leaves and clusters of white catkins half covered in brown shells. A couple of miles past the lochan, and we reached the range of snow-covered runlets, where we were initiated into the peculiar beverage of the Alpine Club, of which, for my own part, I hope often again to partake, but do not intend to divulge. It was here, also, beside perpetual snow, that I found the specimen of *Luzula arcuata* which now graces the Marlborough Herbarium: it is a small drooping flowering rush, and glad I was to find it, as I had sought for him in vain on many hill-tops. Soon after we reached the top, which is broad and flat, bleaker, barer, and more crumbled than ever. It was a day of very great heat, so that there was a thick haze, and we had no distant view. We did not, however, think ourselves losers by this; the day before we had been up Lochnagar, another of the same range, and had had a day of perfect clearness. To-day, being among higher hills, we thought that the indistinctness with which they were seen added to their massive grandeur. We had no sight of the green banks or of the "birks of Dee:" opposite is

Brae Riach, the King's Steep, a rugged pile, if possible, vaster and barer than Ben Muich Dhui, on which we stand. Almost the only plants which grow at our feet are the parsley fern and the *Silene acaulis*, or mountain campion: it is perhaps the most beautiful of alpine flowers; it grows like in cushions of bright green starred over with pink flowers. Wordsworth, in his diary, laments that too inquisitive tourists had uprooted it altogether from Ingleborogh, where he had been wont to find it. I intend now to dismiss our alpine plants and descend as fast as may be to the valley of the Spey, but first I shall try and write the character of the mountain plants. They are all small and delicate in stem, and very bright, piercingly bright I might say, some in leaf and almost all in flower. Blue, white, yellow, pink, and purple, flowers:—the brightest always grow in the hills. I fancy it is owing to the great moisture of the soil and atmosphere, which saturates not only the leaf but the flower. When taken from their mountain crevices and put in gardens they lose their character: the leaves grow more profusely, and the flowers more abundant, but without the first freshness of colour.

Our descent into Spaeside I mean to cut short, though it lasted for eight hours; the descent was long and steep, and, for our party, difficult. At four o'clock we were cheered to hear that we had full sixteen miles to walk, with no road, except, perhaps, for the last three. The first three were so rough that mounting the ponies was impossible, and the lady of our party, plucky to the last, began, it was plain, to be something tired. We are now at the source of the Dee, the top of the pass where, as the country people say, wind and water shear, the stream on one side flowing northwards to the Spey and on the other southwards to Brae Mar. The pass is one of the finest in Scotland, though but little known—its name is the Larig Ru, or Red Pass, from the red colour of the rocks on one side, now redder than ever in the setting sun. Slowly we descend with the winding stream to the moorlands. I must here stop for a moment to narrate that I here captured a fine beetle, the *cicindela*; it is of a respectable size and green in colour with yellow spots. Its legs are very long, so much so indeed that it is difficult to keep pace with it, even on the level ground. As we passed the moorland the banks of our stream began to be covered with the Scotch fir, under which again I fruitlessly sought for the *Linnæa*. Soon we were on the grass and heather of the plain, where we started a buck and a hind drinking. Next came an outlying farm, a welcome sight; it was the old farmer here who remembered the heat of 1826, and I hope he may long live to remember it. Here we eat scones fresh from the girdle, and drank of milk or cream rather, and were directed on our way. The way took us beside a lovely lake, whereon was an island, and on the island a castle, and on the castle we were told an eagle had hatched her young the winter before. At half-past nine o'clock, though it was still almost broad daylight, we reached our inn, the "Boathouse of Rothiemurchus" it was called. It is a little quiet old-fashioned house, kept by a little quiet old-fashioned woman, on the banks of the Spey, which wound past in long and large pools. Though it was ten o'clock, bathing was irresistible, and not regretted:—then turning in, we supped on the porridge of the district, a wholesome diet, also provocative of sleep, where, not without invoking the Divine benison on days spent in the Highlands, as well as spent elsewhere, it may be well to leave us.

There were 90 persons present, 4 Honorary Members, 17 Members, 1 Medius Socius, and 68 Visitors.

ENTOMOLOGY.

The list of Entomological Notices for this half-year is, perhaps, the longest that we have ever had. Although the break in the half-year, owing to the school leaving Marlborough for an Easter Vacation, of course did Entomology much harm, yet this has been much more than merely compensated for, by the half-year having been lengthened so far into the summer. But although the list is so good, we could hope for a little more general help from the members of the Society, as it will be seen that nearly all the notices have been obtained by the same few persons. At the same time it must be remembered that as the list only mentions *first* notices, the names of some helpers do not appear in consequence of their not being able to be the first discoverer of a moth.

Names of those whose initials occur in the following list.

A.H.A.	A. H. Allen.
H.R.A.	H. R. Armstrong.
T.S.F.B.	T. S. F. Battersby.
H.B.	Rev. H. Bell.
A.M.B.	A. M. Bell, Esq.
P.C.B.	P. C. Bicknell.
A.C.C.	A. C. Champneys.
W.H.C.	W. H. Churchill.
W.C.	Mr. W. Coleman.
J.G.C.	Mr. J. G. Crow.
S.B.D.	S. B. Dixon, Esq.
J.W.D.	J. W. Dudding.
S.W.F.	S. W. Featherstone.
W.D.F.	W. D. Fenning.
S.C.V.F.	S. C. V. Filleul.
J.E.F.	J. E. Fletcher.
J.B.F.	J. B. Fuller.
A.A.G.	A. A. Gill.
B.J.G.	B. J. Guillemard.
E.L.H.	E. L. Hesketh.
P.L.H.	P. L. Hesketh.
A.A.H.	A. A. Hoffmann.
F.E.H.	F. E. Hulme, Esq., F.L.S.
F.J.H.J.	F. J. H. Jenkinson.
W.H.M.	W. H. Macdonald, Esq.,
W.M.	W. Mansell, Esq.

G.H.P.	G. H. Perry.
H.A.M.P.	H. A. M. Power.
H.S.	H. Sankey.
C.A.S.	C. A. Sladen.
S.J.S.	S. J. Soady.
J.S.	Rev. J. Sowerby.
F.S.	F. Storr, Esq.
F.E.T.	F. E. Thompson, Esq.
S.F.T.	S. F. Townsend.
H.J.V.	H. J. Verrall.
T.F.W.	T. F. Wilson.

As usual an H added to the date signifies that the specimen was a hibernated one.

RHOPALOCERA.

Gonepteryx Rhamni	Brimstone	Mar. 17	S.C.V.F.
Colias Edusa	Clouded Yellow	June 29	C.A.S.
Pieris Brassicæ	Large White	March 31	J.S.
P. Rapæ	Small White	April 1	G.H.P.; T.F.W.
P. Napi	Green-veined White	April 12	C.A.S.
Anthocharis Cardamines	Orange Tip	May 9	C.A.S.
Lasiommata Ægeria	Wood Argus	May 26	G.H.P.
L. Megæra	Wall Brown	May 15	P.L.H.
Hipparchia Janira	Meadow Brown	June 14	E.L.H.
H. Tithonus	Gatekeeper	July 7	J.B.F.
H. Hyperanthus	Ringlet	June 25	E.L.H.
H. Semele	Grayling	June 23	C.A.S.
Cœnonympha Pamphilus	Small Heath	May 16	C.A.S.
Cynthia Cardui	Painted Lady	Mar. 17, H	E.L.H.
	this year's brood	July 10	F.E.H.
		June 3	— Hunter.
Vanessa Atalanta	Red Admiral	April 23, H	C.A.S.
V. Polychlorus	Large Tortoiseshell	April 5, H	F.S.
	this year's brood	July 20	T.F.W.
V. Io	Peacock	Jan. 13, H	C.A.S.
		Mar. 9, H	W.H.C.; A.H.A.
	this year's brood	May 26	J.B.F.
V. Urticæ	Small Tortoiseshell	March 8, H	C.A.S.
	this year's brood	June 4	G.H.P.

Argynnis Paphia	Silver-washed Fritillary	July 7	G.H.P.
A. Adippe	High Brown Frit.	June 23	B.J.G.
A. Aglaia	Dark-green Frit.	June 23	C.A.S.
A. Euphrosyne	Pearl-bordered Frit.	May 16	C.A.S.
A. Selene	Small Pearl-bordered Fritillary	June 2	E.L.H.
Nemeobius Lucina	Duke of Burgundy Fritillary	June 14	J.B.F.
Thecla Rubi	Green Hairstreak	June 1-7	W.C.
Chrysophanus Phlœas	Small Copper	May 15	J.B.F.
Polyommatus Argiolus	Holly Blue ... seen caught	April 16 April 18	C.A.S.
	second brood	July 20	G.H.P.
P. Alsus	Bedford Blue	May 28	J.B.F.
P. Alexis	Common Blue	May 19	P.L.H.
P. Corydon	Chalk-hill Blue	June 23	C.A.S.
P. Agestis	Brown Argus	May 27	G.H.P.
Thymele Alveolus	Grizzled Skipper	May 18	J.B.F.
Thanaos Tages	Dingy Skipper	May 18	G.H.P.
Pamphila Sylvanus	Large Skipper	June 3	W.M.
P. Linea	Small Skipper	June 25	F.J.H.J.

SPHINGINA.

Procris Statices	Green Forester	May 26	J.B.F.
Anthrocera Filipendulæ	Six Spotted Burnet	June 25	J.B.F.
A. Loniceræ	Five Spotted Burnet	June 21	J.S.
Smerinthus Populi	Poplar Hawk	June 3	J.S.
S. Tiliæ	Lime Hawk	May 23	J.B.F.
	larvæ, full grown	July 24-25	S.F.T.; S.J.S.
Sphinx Ligustri	Privet Hawk	June 9	H.R.A.
Chærocampa Elpenor	Large Elephant Hawk	June 6	F.E.T.
C. Porcellus	Small Elephant Hawk	July 15	T.F.W.
Macroglossa Stellatarum	Humming-bird Hawk	June 16	J.B.F.
Trochilium Tipuliforme	Currant Clearwing	June 20	W.C.
Sesia Bembeciformis	Hornet Clearwing	June 25	A.A.H.

BOMBYCINA.

Hepialus Lupulinus	Common Swift	May 25	P.C.B.
H. Sylvinus	Wood Swift	May 25	J.S.
H. Hectus	Golden Swift	July 19	F.J.H.J.
H. Humuli	Ghost Swift	July 14	C.A.S.

Dasychira Pudibunda	Pale Tussock (bred)	May 27	J.B.F.
Nudaria Mundana		July 22	F.J.H.J.; W.M.
Lithosia Complanula	Common Footman	July 7	J.B.F.
Arctia Caja	Garden Tiger	July 4	H.B., A.M.B.
Nemeophila Plantaginis	Wood Tiger	May 26	G.H.P.
Spilosoma Menthrasti	Ermine	May 27	G.H.P.
S. Lubricepeda	Buff Ermine	May 29	J.W.D.
Diaphora Mendica	Muslin	May 17	H.S.
Callimorpha Jacobææ	Cinnabar	May 8	W.H.M.
Lasiocampa Quercus	Oak Eggar (larva)	April 4	C.A.S.
		July 14	S.J.S.
Eriogaster Lanestris	larva	March 27	C.A.S.
Odonestis Potatoria	Drinker	July 5	G.H.P.
Cerura Vinula	Puss Moth	June 15	W.C.
Lophopteryx Camelina		June 25	W.M.
Diloba Cæraleocephala	Figure of Eight (larva)	June 12	G.H.P.
Cilix Spinula	Chinese Character	May 21	W.M.
		July 15	G.H.P.
Drepana Falcataria	Pebble Hooktip	May 28	J.S.
D. Unguicula	Barred Hooktip	May 24	J.B.F.

NOCTUINA.

Bryophila Perla	Marbled Beauty	June 29	W.M.
Acronycta Psi	Grey Dagger	June 22	F.J.H.J.
Leucania Pallens	Wainscot	June 26	W.M.
L. Lithargyria		July 12	F.J.H.J.
Xylophasia Polyodon		June 16	W.M.
Heliophobus Popularis	Feathered Gothic	July 11	S.W.F.
Mamestra Brassicæ		June 1	W.M.
Apamea Basilinea		June 14	F.J.H.J.
A. Unanimis		July 18	W.M.
A. Oculea		July 9	F.J.H.J.
Grammesia Trilinea		June 3	W.M.
Rusina Tenebrosa		June 2	W.M.
Agrotis Exclamationis		June 14	F.J.H.J.
Triphæna Pronuba		June 8	H.R.A.
T. Orbona		July 14	F.J.H.J.
Euplexia Lucipara		June 23	J.B.F.
Hadena Dentina		June 21	F.J.H.J.
H. Oleracea		June 21	F.J.H.J.
Cucullia Umbratica		June 28	W.C.

Plusia Iota		June 28	W.C.
Grammesia Trilinea		June 4	W.M.
Cosmia Trapetzina		July 25	J.B.F.
Caradrina Cubicularis		July 14	(late) F.J.H.J.
Plusia Gamma	Silver Y	May 26	C.A.S.
Gonoptera Libatrix	Herald	May 19	W.M.
Mania Maura		July 14	S.W.F.
Euclidia Mi	Mother Shipton	May 21	E.L.H.

GEOMETRINA.

Ourapteryx Sambucata	June 30	A.A.G.
Rumia Cratægata	May 21	G.H.P.
Angerona Prunaria	June 25	B.J.G.
Metrocampa Margaritata	July 15	G.H.P.
Pericallia Syringaria	July 15	G.H.P.
Selenia Illunaria	July 13	F.J.H.J.
Amphidasis Betularia	June 13	W.C.
Boarmia Repandata	July 1	G.H.P.
Iodis Lactearia	May 26	C.A.S.
Ephyra Porata	July 20	W.M.
E. Punctata	May 26	J.B.F.
Asthena Luteata	June 25	F.J.H.J.
A. Candidata	May 18	J.B.F.
A. Sylvata	June 14	F.J.H.J.
Acidalia Scutulata	July 8	J.B.F.
A. Bisetata	July 8	G.H.P.
A. Trigeminata	July 23	J.B.F.
A. Remutata	June 14	F.J.H.J.
A. Imitaria	July 13	F.J.H.J.
A. Aversata	June 4	G.H.P.
Cabera Pusaria	May 21	E.L.H.
C. Exanthemaria	May 21	J.B.F.
Halia Wavaria	July 15	J.E.F.
Strenia Clathrata	July 7	E.L.H.
Lozogramma Petraria	May 24	G.H.P.
Minoa Euphorbiata	June 2	G.H.P.
Abraxas Grossulariata	July 2	G.H.P.
Ligdia Adustata	July 7	J.B.F.
Lomaspilis Marginata	May 24	A.C.C.
Hibernia Rupicapraria	plentiful March 19	F.J.H.J.

A. Progemmaria	March 20	H. A. M. P., T.S.F.B.
Larentia Didymata	July 22	F.J.H.J.
Coremia Pectinitaria	June 2	J.B.F.
Emmelesia Affinitata	June 25	F.J.H.J.
E. Alchemillata	July 14	F.J.H.J.
Ypsipetes Elutata	July 14	F.J.H.J.
Melanthia Rubiginata	June 30	P.C.B.
Melanippe Unangulata	July 7	J.B.F.
M. Rivata	May 21	J.B.F.
M. Montanata	May 18	J.B.F.
M. Fluctuata	May 15	W.M.
Anticlea Rubidata	June 14	F.J.H.J.
Camptogramma Bilineata	June 13	G.H.P.
Scotosia Vetulata	July 14	F.J.H.J.
S. Rhamnata	July 13	F.J.H.J.
Cidaria Picata	June 25	F.J.H.J.
C. Corylata	June 14	G.H.P.
C. Russata	May 28	G.H.P.
C. Prunata	July 6	S.W.F.
C. Fulvata	June 29	G.H.P.
C. Dotata	July 1	W.M.
C. Pyraliata	July 7	E.L.H.
Eubolia Mensuraria	July 14	F.J.H.J.
E. Plumbaria	June 4	J.B.F.
Anaitis Plagiaria	June 16	F.J.H.J.
Odezia Chærophyllata	June 2	J.B.F.

PYRALIDINA.

Hypena Proboscidalis	July 14	F.J.H.J.
Pyrausta Purpuralis	June 25	F.J.H.J.
Cataclysta Lemnalis	July 24	W.D.F.
Paraponyx Stratiotata	July 18	F.J.H.J.
Acentropus niveus	June 6	J.B.F.
Botys Verticalis	July 11	F.J.H.J.
B. Urticata	May 27	J.W.D.
B. Fuscalis	June 14	F.J.H.J.
Ebulea Sambucalis	June 16	F.J.H.J.
Scopula Olivalis	June 14	F.J.H.J.
Aphomia Colonella	June 14	F.J.H.J.
Crambus pinetellus	June 25	F.J.H.J.

TINEINA.

Tinea Tapetzella	June 21	F.J.H.J.
Adela de Geerella	June 14	F.J.H.J.
Depressaria Applana	March 17	F.J.H.J.
Pterophorus Pentadactylus	June 2	W.M.

OTHER NOTICES.

Wasp	March 1	J.G.C.
Cock-chafer	March 5	seen by H.R.A.
Lady-bird	March 10	H.J.V.
Glow-worm	March 31	S.B.D.

ORNITHOLOGICAL NOTICES.

NAMES of those whose initials occur in the following list:—

A.G.B.	A. G. Bankart.
A.W.B.	A. W. Banks.
F.G.B.	F. G. Bond.
S.B.	S. Brown.
A.B.	A. Busk.
G.T.P.C.	G. T. P. Cambridge.
J.H.R.C.	J. H. R. Clark.
R.C.	R. Constable.
W.C.	Mr. W. Coleman.
J.G.C.	Mr. J. G. Crow.
C.E.D.	C. E. Down.
W.A.E.	W. A. Eckersley.
S.W.F.	S. W. Featherstone.

A.B.F.	A. B. Fenton.
S.C.V.F.	S. C. V. Filleul.
J.F.	J. Forster.
J.B.F.	J. B. Fuller.
R.G.	R. Geldard.
H.G.	H. Gordon.
S.W.G.	S. W. Greenhow.
J.G.	J. Grigg.
L.H.	L. Hart.
E.L.H.	E. L. Hesketh.
P.L.H.	P. L. Hesketh.
C.P.H.	C. P. Hooker.
A.H.J.	A. H. James.
L.	Lee.
H.M.	H. Manders.
G.C.M.	G. C. Mansel.
J.B.O.	J. B. Oakeley.
T.C.O.	T. C. Owen.
G.H.P.	G. H. Perry.
H.G.P.	Mr. H. G. Parker.
J.J.P.	J. J. Purdon.
E.E.R.	E. E. Robinson.
R.	Mr. Rushen.
G.J.S.	G. J. Scott.
C.A.S.	C. A. Sladen.
W.D.S.	W. D. Steel.
F.H.T.	F. H. Thirlwall.
W.H.W.	W. H. Williams.

Kestrel (Falco tinnunculus)—egg June 4th, L.

Sparrow Hawk (Accipiter nisus)—egg May 13th.

Tawny Owl (Syrnium stridula)—2 eggs laid about March 1st; 6 eggs (partially hard set) March 11th; 3 eggs (fresh) April 10th.

Red-backed Shrike (Lanius collurio)—egg May 31st, C.E.D.

Spotted Flycatcher (Muscicapa griseola)—seen April 15th, C.A.S.

Missel Thrush (Turdus viscivorus)—egg April 7th, S.W.F., & F.G.B.

Song Thrush (Turdus musicus)—on the 1st of March a Song Thrush had been sitting for a fortnight on 4 eggs (*Marlborough Times*).

Blackbird (Turdus merula)—3 eggs (hard set) April 8th, C.H.P. & A.G.B.

Ring Ouzel (Turdus torquatus)—seen April 9th, R.

Hedge Accentor (Accentor modularis)—4 eggs April 5th, J.G.C.

Redbreast (Erythaca rubecula)—egg May 12th, C.A.S.; 5 eggs June 3rd, A.B.

Redstart (Phœnicura ruticilla)—seen Feb. 6th, H.M. and J.H.R.C., and April 9th, R.; egg May 14th, G.T.P.C.

Whinchat (Saxicola rubetra)—seen April 21st, W.C.; egg June 4th, J.B.F. & G.H.P.

Wheatear (Saxicola œnanthe)—picked up dead March 28th, W.C.; egg May 19th, R.C.

Grasshopper Warbler (Salicaria locustella)—seen April 23rd, R.; egg May 26th, J.B.F. and G.H.P.

Sedge Warbler (Salicaria phragmitis)—seen May 12, J.G.C.; egg June 1st, J.B.O.

Reed Warbler (Salicaria arundinacea)—shot April 9th, R.; 5 eggs April 27th, C.A.S.

Nightingale (Philomela luscinia)—nest May 4th, J.B.F. and G.H.P.

Blackcap (Curruca atricapilla)—seen April 24th, R.

Garden Warbler (Curruca hortensis)—seen April 9th, R.; egg May 26th, E.E.R.

Greater Whitethroat (Curruca cinerea)—seen April 13th, C.A.S.; egg about May 26th, G.C.M.

Willow Warbler (Sylvia trochilus)—seen April 21st, W.C.; egg June 2nd, J.B.F., E.L.H.

Chiff-chaff (Sylvia rufa)—heard March 10th, S.C.V.F.

Golden-crested Regulus (Regulus cristatus)—egg April 28th.

Greater Tit (Parus major)—egg May 14th, G.T P.C.

Blue Tit (Parus cæruleus)—egg May 14th, G.T.P.C.

Cole Tit (Parus ater)—egg May 17th, A.H.J., and May 24th, L.H.

Pied Wagtail (Motacilla yarrellii)—pairing March 8th, E.L.H.

Sky Lark (Alauda arvensis)—egg May 12th, J.B.O.; young birds May 24th, J.B.F., E.L.H.

Common Bunting (Emberiza miliaria)—egg June 20th, J.B.O.

Black-headed Bunting (Emberiza schœniclus)—egg June 1st, J.B.O.

Yellow Bunting (Emberiza citrinella)—3 eggs May 14, T.C.O.; young birds May 13th, J.J.P., A.W.B., S.W.G.; egg July 14th, W.H.W.

Chaffinch (Fringilla cœlebs)—3 eggs April 25th, C.A.S.

House Sparrow (Passer domesticus)—building Feb. 23, H.G.; egg May 14th, J.B.O., S.C.V.F.

Common Linnet (Fringilla cannabina)—egg May 15th.

Green Finch (Coccothraustes chloris)—egg May 4th, C.A.S.; and June 16th (late), G.C.M.

Bullfinch (Pyrrhula vulgaris)—egg May 18th, J.B.O., G.H.P.

Crossbill (Loxia curvirostra)—seen March 8th, J.B.O., S.C.V.F.

Starling (Sturnus vulgaris)—egg April 11th, J.B.O.

Carrion Crow (Corvus corone)—4 eggs April 23rd, C.A.S.

Rook (Corvus frugilegus)—building March 1st; 3 eggs March 24th, J.B.O., W.D.S., J.G.

Jackdaw (Corvus monedula)—3 eggs April 6th, H.G.P.

Magpie (Pica caudata)—3 eggs April 13th, H.G.P.

Jay (Garrulus glandarius)—egg May 18th, J.B.F., G.H.P.

Green Woodpecker (Picus viridis) egg May 17th, J.B.O., S.C.V.F.

Greater Spotted Woodpecker (Picus major)—seen February 26th, J.B.O., S.C.V.F.; young birds June 10th.

Lesser Spotted Woodpecker (Picus minor)—seen April 8th.

Wren (Troglodytes vulgaris)—egg May 19th, R.G., J.F.

Nuthatch (Sitta europæa) egg April 23rd, W.C.

Cuckoo (Cuculus canorus)—heard April 9th, H.G.P.

Swallow (Hirundo rustica)—seen April 5th, J.G.C., April 7th, W.C.; egg June 3rd, J.B.F.

House Martin (Hirundo urbica)—seen April 6th, C.A.S.

Sand Martin (Hirundo riparia)—seen April 10th, R.; egg May 28th, C.A.S., E.L.H., J.B.O.

Swift (Cypselus apus)—seen April 18th, J.G.C.; egg June 14th, F.H.T.; 3 eggs June 15th, A.B.F. & W.A.E.

Ring Dove (Columba palumbus)—building March 31st, E.L.H., P.L.H.; 2 eggs April 12th, E.L.H., P.L.H.

Stock Dove (Columba œnas)—2 eggs April 7th, (partly set), R.C., S.B.

Turtle Dove (Columba turtur)—heard April 30th, R.

Pheasant (Phasianus colchicus)—egg May 14th, J.B.O.—"We consider it very early here by the 12th April," Mr. Gauntlett.

Partridge (Perdix cinerea)—3 eggs May 18th, S.C.V.F.; building March 21st, H.M.

Peewit (Vanellus cristatus)—7 eggs April 6th, H.G.P., six eggs from the same nest, April 11th, H.G.P., 3 eggs June 13th, G.J.S.

Heron (Ardea cinerea)—young birds April 20th, R.

Sandpiper (Totanus hypoleucos)—seen April 10th, C.A.S.

Woodcock (Scolopax rusticola)—seen March 17th; were also seen in April; probably bred near Marlborough.

Landrail (Crex pratensis)—seen April 25th, R.; egg May 14th, J.B.O., S.C.V.F.

Moorhen (Gallinula chloropus)—eggs April 4th, R.; 5 eggs April 6th, H.G.P.

Pintail Duck (Anas acuta)—shot at Mildenhall, February 26th, R.

Scaup Duck (Fuligula marila)—shot at Mildenhall, Feb. 15th, Rev. C. Soames.

Little Grebe (Podiceps minor)—egg April 22nd, W.C.
Little Gull (Larus minutus)—picked up dead on Rockley Downs, Feb. 14th.

Owing to the Easter holidays we have been unable to get as many notices as we could have wished. By the kind help of some of the Townspeople, however, our list is much more perfect than it would otherwise have been. There are three new species added to our list: viz., Lesser Spotted Woodpecker (*Picus minor*), Pintail Duck (*Anas acuta*), and Little Gull (*Larus minutus*). This latter bird is an extremely rare visitant of England, especially in the south. The Heron has never before appeared in our list, although it is found a short way off Marlborough.—With respect to this last bird Mr. Gauntlett writes: "The Herons breed within a mile of my house (Bloxham's Lodge, in Savernake Forest), about three or four nests every year. I have never allowed them to be disturbed, but it is strange they do not increase. The young ones are now (May 20th) just flown. Unfortunately two young ones were blown from the nest and died, although the old ones fed them on the ground for several days: but finding they could not get them to take wing, I much believe they neglected to feed them."

BOTANICAL NOTICES.

The subjoined list is by far the most perfect we have ever been able to draw up. In order to have a *complete* List of Plants hitherto detected in the neighbourhood of Marlborough, we have inserted the names of those upon which no observations have been recorded, and it will be seen, therefore, how very few have escaped observation this year.

The past season has been a very peculiar one; the great cold in January and February and the excessive drought later on in the year have told upon vegetation and the addition to our List of the *duration* of the time of flowering will well repay a careful perusal.

During January no fresh flowers appeared in bloom, the few that could be obtained (only about 11 in number) were those which had survived the cold of December.

During February but very few plants came into flower. Crocuses, Snowdrops and Aconites were in flower by the 11th, but only the latter in any quantity. Scarcely any *wild* flowers were in bloom.

During March a few more plants came into flower, but by the 31st there were far fewer flowers open than usual, and not a single species absolutely common. Crocuses and Snowdrops were still in flower on the 31st, and the buds of some trees were bursting, but nothing properly in leaf. Gooseberries and Honeysuckle in warm gardens were in leaf, and a single branch of Lilac opened its buds on the 4th, but the young leaves were speedily killed by the frost. The Laurustinus too appeared in flower on the 1st, but the flowers were afterwards also destroyed by the frost.

During April vegetation was still very backward; by the 14th (when the School broke up for the Easter Holidays) Gooseberries and Currants were in leaf, and also Larches in very warm spots. Peaches, Apricots and Pears against walls were in flower. The Horse-chesnut and Hawthorn were getting green, and the Lime and Lilac buds were bursting, every other tree appeared in its winter dress. During the rest of the month and for the first half of May we are indebted to F. E. Thompson, Esq., for the notices recorded.

During May a fair number of plants were in flower, but not so many as usual and it was not till the beginning of June that vegetation was as far advanced as in ordinary years. Towards the end of the month, however, the drought had told severely and the number of plants in flower had seriously fallen off by the end of July, as will appear from the Table.

This being the first time the School remained at Marlborough during July, we naturally expected to make great additions to our Lists, the drought, however, dried up all our marshy spots, and hence, though we have made several additions, and have found that some plants, hitherto considered rare, are by no means uncommon, we have not made our list as long as we had hoped.

The Table of duration of flowering requires a large number of notices. It is impossible to enter the names of those who have aided in the work, as the names of "First Discoverers" are entered, and hence a very wrong impression may be formed of the help obtained from the School generally—especially when so many first notices have been obtained by Messrs. Sowerby and Thompson, to whom our thanks are especially due. It has been decided, therefore to include in the List of "First Discoverers" the names also of those who have assisted in the work. As this decision was only come to after the List was made up, it is possible some few names may have been omitted, if there are any so omitted we trust that our apologies for the omission will be accepted.

An asterisk has been prefixed to the names of *cultivated* species—"by" indicates that the specimen observed had apparently been in flower a day or two before being discovered—and a ? has been placed in the Table when the plant was *probably* in flower, though from various reasons no notice of its occurrence in that month was recorded.

Names of those whose initials occur in the following List, or who have otherwise aided in perfecting it.

E.A.	E. Almack.
H.R.A.	H. R. Armstrong.
A.W.B.	A. W. Banks.
T.S.F.B.	T. S. F. Battersby.
H.B.	Rev. H. Bell.
R.H.B.	R. H. Bicknell.
C.V.B.	C. V. Boys.
M.B.	Miss Mabel Bradley.
C.L.G.B.	C. L. G. Broughton.
A.B.	A. Busk.
G.T.P.C.	G. T. P. Cambridge.
S.F.C.	S. F. Chichester.
D.C.	D. Coles.
J.M.L.D.	J. M. L. Davies.
G.W.D.L.	Rev. G. W. DeLisle.
R.E.D.	R. E. Dennett.
H.S.D.	H. S. Dickinson.
S.B.D.	S. B. Dixon, Esq.
J.W.D.	J. W. Dudding.
S.W.F.	S. W. Featherstone.

W.D.F.	W. D. Fenning.
S.C.V.F.	S. C. V. Filleul.
J.B.F.	J. B. Fuller.
J.H.G.	J. H. Garland.
A.A.G.	A. A. Gill.
J.B.G.	J. B. Gilmore, Esq.
H.C.G.	H. C. Glyn.
W.G.	W. Goodchild.
H.G.	H. Gordon.
J.W.G.	J. W. Griffith.
C.R.G.	C. R. Gunner.
E.L.H.	E. L. Hesketh.
P.L.H.	P. L. Hesketh.
H.B.H.	H. B. Horner, Esq.
F.E.H.	F. E. Hulme, Esq., F.L.S.
H.T.K.	H. T. King.
F.L.	F. Leigh.
E.W.M.L.	E. W. M. Lloyd, Esq.
N.L.	N. Loring.
D.C.W.L.	D. C. W. Lysons.
W.H.M.	W. H. Macdonald, Esq.
C.G.H.M.	C. G. H. Mann.
G.C.M.	G. C. Mansel.
W.M.	W. Mansell, Esq.
A.S.M.	A. S. Marshall-Hall.
G.E.M.	G. E. Mew.
A.L.N.	A. L. Napier.
G.N.	G. Nares.
W.M.N.	W. M. Norsworthy.
J.B.O.	J. B. Oakeley.
G.H.P.	G. H. Perry.
H.A.M.P.	H. A. M. Power.
C.S.	C. Sankey, Esq.
G.J.S.	G. J. Scott.
C.A.S.	C. A. Sladen.
J.S.	Rev. J. Sowerby.
E.C.S.	E. C. Stanton.
E.W.S.	E. W. Swetenham.
C.W.T.	Rev. C. W. Tayler.
F.E.T.	F. E. Thompson, Esq.
C.E.T.	Rev. C. E. Thorpe.

T.	Tottenham.
S.F.T.	S. F. Townsend.
C.R.W.	C. R. Waldron.
H.H.W.	H. H. Ward.
W.H.K.W.	W. H. K. Ward.
T.F.W.	T. F. Wilson.
H.J.W.	H. J. Wood.

DICOTYLEDONS.

THALAMIFLORÆ.

RANUNCULACEÆ.

Clematis								
Vitalba	—	—	—	—	—	—	j	by July 16, F.E.T.
Thalictrum								
flavum	—	—	—	—	—	j	j	June 10, F.E.T.
***aquilegifolium**	—	—	—	—	m	j	—	May 29.
Anemone								
nemorosa	—	—	m	a	mm	—	—	Mar. 20, C.R.G. & W.D.F.
***hepatica**	—	—	m	a	—	—	—	March 1, G.W.D.L.
***sylvestris**	—	—	—	—	m	j	—	by May 12.
Adonis								
autumnalis	—	—	—	—	—	—	—	
Myosurus								
minimus	—	—	—	—	m	—	—	in seed June 6.
Ranunculus								
trichophyllus	—	—	—	—	m	—	—	by May 27, J.S.
Drouettii	—	—	—	—	—	—	—	
heterophyllus	—	—	—	a	mm	jj	j	April 17, F.E.T.
pseudo-fluitans	—	—	—	—	m	j	j	by May 28.
peltatus	—	—	—	a	mm	j	j	April 25, F.E.T.
circinatus	—	—	—	—	m	j	—	full fl. May 28, F.E.T.
hederaceus	—	—	—	—	m	?	—	full fl. May 28, F.E.T.
sceleratus	—	—	—	—	m	?	—	by May 24, J.S. & F.E.T.
Flammula	—	—	—	—	m	j	j	May 30, F.E.T.
Ficaria	—	—	m	aa	m	—	—	March 1, G.W.D.L.
auricomus	—	—	—	a	m	—	—	April 10, F.E.T.
acris	—	—	—	a	mm	jj	j	April 14, F.E.T.

repens	—	—	—	a	mm	jj	j	April 20, F,E.T.
bulbosus	—	—	—	a	mm	j	—	April 7, J.S.
parviflorus	—	—	—	—	—	—	—	could not be found.
arvensis	—	—	—	—	m	jj	j	May 20, J.S.
Caltha								
palustris	—	—	m	a	m	j	—	March 20, S.W.F.
Trollius								
*europæus	—	—	—	—	m	—	—	by May 12.
Eranthys								
*hyemalis	—	f	m	—	—	—	—	by Feb. 11.
Helleborus								
viridis	—	—	m	a	?	—	—	March 12, F.E.T.
*fœtidus	—	—	m	?	—	—	—	about March 23, J.S.
Aquilegia								
vulgaris	—	—	—	—	m	j	—	May 15, G.W.D.L.
BERBERIDACEÆ.								
Berberis								
vulgaris	—	—	—	—	m	?	—	by May 22, J.S.
*fascicularis	—	—	—	a	?	—	—	April 12.
NYMPHÆACEÆ.								
Nuphar								
lutea	—	—	—	—	—	j	j	June 17, J.S.
PAPAVERACEÆ.								
Papaver								
Argemone	—	—	—	—	m	j	—	May 20, J.S.
Rhœas	—	—	—	—	—	jj	j	June 5, F.E.T.
var. strigosum	—	—	—	—	—	j	—	June 10, F.E.T.
dubium	—	—	—	—	m	j	j	May 30, J.S.
Lecoqii	—	—	—	—	—	j	—	June 21, F.E.T.
somniferum	—	—	—	—	—	j	—	June 28, F.E.T.
*orientale	—	—	—	—	m	j	—	May 29.
Meconopsis								
*cambrica	—	—	—	—	m	j	—	by May 29.
Chelidonium								
majus	—	—	—	a	m	jj	j	April 25, J.S
FUMARIACEÆ.								
Corydalis								
*solida	—	—	m	a	—	—	—	March 25.
Fumaria								
officinalis	—	—	—	a	m	jj	j	April 16, F.E.T.

CRUCIFERÆ

Cheiranthus								
Cheiri	—	—	—	?	m	—	—	full fl. May 18, J.S.
Nasturtium								
officinale	—	—	—	—	m	jj	j	May 28, F.E.T.
sylvestre	—	—	—	—	—	—	—	
palustre	—	—	—	—	m	j	j	May 18, J.S.
Barbarea								
vulgaris	—	—	—	—	m	j	—	May 12, J.S. & F.E.T.
Arabis								
hirsuta	—	—	—	—	m	—	—	May 12, J.S. & F.E.T.
Cardamine								
sylvatica.........	—	—	—	—	m	—	—	May 12, J.S. & F.E.T.
hirsuta	—	—	m	a	m	—	—	by March 17, J.S.
pratensis.........	—	—	—	a	mm	j	—	April 14, F.E.T.
Sisymbrium								
officinale	—	—	—	—	m	j	j	May 12, J.S. & F.E.T.
thalianum	—	—	—	—	m	—	—	seed May 22, J.S.
Alliaria								
officinalis	—	—	—	a	m	j	—	April 20, F.E.T.
Erysimum								
cheiranthoides	—	—	—	—	—	j	j	June 21, F.E.T.
Brassica								
*oleracea	—	—	—	a	m	j	—	April 19, J.S. & F.E.T.
campestris	—	—	—	a	m	j	j	April 19, J.S. & F.E.T.
Napus	—	—	—	—	—	j	—	June 17, J.S.
Lunaria								
*biennis	—	—	—	—	m	j	—	by May 22, G.W.D.L.
Sinapis								
nigra	—	—	—	—	—	—	—	
arvensis	—	—	—	—	m	jj	j	May 19, J.S.
alba	—	—	—	—	m	jj	j	May 31, D.C.W.L.
Alyssum								
calycinum	—	—	—	—	—	j	—	seed June 30, S.F.T.
incanum	—	—	—	—	—	—	j	full fl. July 15, G.W.D.L.
Aubrietia								
*purpurea.	—	—	m	a	m	—	—	by March 31, G.W.D.L.
Draba								
verna	—	—	m	a	mm	—	—	March 6, J.S.
Armoracia								
rusticana.........	—	—	—	—	m	j	—	by May 26, J.S.

Thlaspi								
arvense	—	—	—	—	m	—	—	by May 27, J.S.
Lepidium								
campestre	—	—	—	—	m	—	—	May 16, F.E.T.
Capsella								
Bursa-pastoris	h	h	h	a	mm	jj	j	March 29, J.S. (? hybernated specimen).
Senebiera								
Coronopus	—	—	—	—	—	j	j	June 21, F.E.T.
Isatis								
*tinctoria	—	—	—	—	m	—	—	May 15.
Raphanus								
Raphanistrum ...	—	—	—	—	—	j	j	June 7, J.S.
RESEDACEÆ.								
Reseda								
lutea	—	—	—	—	m	j	j	May 20, J.B.F. & E.L.H.
Luteola	—	—	—	—	—	j	j	June 17, J.S.
CISTACEÆ.								
Helianthemum								
vulgare	—	—	—	—	mm	jj	j	May 16, F.E.T.
VIOLACEÆ.								
Viola								
odorata	—	f	m	aa	—	—	—	(cult.) Feb. 11, (wild) March 21, F.E.T.
var. alba	—	—	m	aa	—	—	—	March 18, W.D F.& C.R.G.
var. rubra	—	—	m	a	—	—	—	March 20, H.A.M.P. and T.S.F.B.
hirta	—	—	m	a	—	—	—	March 25, F.E.T.
Reichenbachiana	—	—	—	a	m	—	—	April 12, F.E.T.
Riviniana	—	—	—	a	mm	j	—	April 16, F.E.T.
canina	—	—	—	—	m	—	—	May 13, F.E.T.
tricolor	—	—	—	a	m	—	—	April 25, F.E.T.
var. arvensis ...	—	—	(m)	a	m	jj	j	March 25, J.S. (hybernated specimen).
POLYGALACEÆ.								
Polygala								
vulgaris	—	—	—	a	mm	jj	j	April 25, F.E.T.
CARYOPHYLLACEÆ.								
Dianthus								
*deltoides	—	—	—	—	—	j	—	June 4.

Saponaria								
officinalis… …..	—	—	—	—	—	—	—	in bud by the end of July
Silene								
inflata …………	—	—	—	—	m	jj	j	May 30, J.S.
Lychnis								
Flos-cuculi ……	—	—	—	—	m	jj	j	by May 28, J.S. & F.E.T.
vespertina ……	—	—	—	—	m	jj	j	May 20, F.E.T.
diurna …………	—	—	—	a	mm	j	j	April 21, F.E.T.
Githago …….	—	—	—	—	—	j	j	June 15, F.E.T.
Sagina								
procumbens …	—	—	—	—	m	j	j	by May 27, H.T.K.
nodosa …………	—	—	—	—	—	—	—	
Arenaria								
trinervis .. ……	—	—	—	a	mm	j	—	April 20th, F.E.T.
serpyllifolia …	—	—	—	—	m	—	—	May 19, J.S.
leptoclados ……	—	—	—	—	m	j	—	full fl. May 26, J.S.
Stellaria								
media …………	h	h	h	a	mm	j	j	all the year.
Holostea ………	—	—	—	a	mm	jj	—	April 11, F.E.T.
graminea………	—	—	—	—	m	j	j	May 30, J.S. & F.E.T.
uliginosa………	—	—	—	—	m	j	j	May 28, F.E.T.
Malachium								
aquaticum ……	—	—	—	—	—	—	—	
Cerastium								
glomeratum …	—	—	—	a	m	(j)	—	April 26, F.E.T.
triviale ………	—	—	(h)	a	mm	jj	j	April 1.
*arvense ………	—	—	—	—	m	—	—	by May 12.
Mœnchia								
erecta …………	—	—	—	—	—	—	—	could not be found.
Spergula								
arvensis ………	—	—	—	—	m	j	j	May 27, J.S.
Scleranthus								
annuus ………	—	—	—	—	—	—	—	
MALVACEÆ.								
Malva								
moschata ……	—	—	—	—	—	j	j	June 20, F.E.T.
sylvestris ……	—	—	—	—	m	jj	j	May 27, C.E.T.
rotundifolia …	—	—	—	—	m	j	j	May 30, F.E.T.
TILIACEÆ.								
Tilia								
*europæa………	—	—	—	—	—	—	jj	July 3, over by July 20.

Hypericaceæ.

Hypericum								
*Androsæmum	—	—	—	—	—	—	j	July 6.
tetrapterum	—	—	—	—	—	j	j	June 20, F.E.T.
perforatum	—	—	—	—	—	j	j	June 20, F.E.T.
humifusum	—	—	—	—	—	j	?	June 17, J.S.
hirsutum	—	—	—	—	—	j	j	June 25, J.S.
pulchrum	—	—	—	—	—	j	j	June 21, J.S.

Aceraceæ.

Acer								
campestre	—	—	—	—	m	j	—	May 12, J.S. & F.E.T.
Pseudo-platanus	—	—	—	—	m	j	—	May 12, J.S. & F.E.T.

Æsculaceæ.

Æsculus								
Hippocastanum	—	—	—	—	m	j	—	May 12, J.S. & F.E.T.

Geraniaceæ.

Geranium								
phæum	—	—	—	—	m	j	—	May 12.
*sylvaticum	—	—	—	—	m	j	—	May 20.
pratense	—	—	—	—	m	jj	j	May 26, F.E.T.
*sanguineum	—	—	—	—	—	j	—	June 4.
*var. lancastriense	—	—	—	—	m	j	—	May 31.
molle	—	—	—	a	mm	j	j	April 26, F.E.T.
rotundifolium	—	—	—	—	m	j	—	May 16.
dissectum	—	—	—	—	m	j	j	May 14, J.S. & F.E.T.
columbinum	—	—	—	—	m	j	—	May 3, J.S.
lucidum	—	—	—	a	mm	j	j	April 27, J.S.
robertianum	—	—	—	a	mm	jj	j	April 28, F.E.T.
*macrorrhizon	—	—	—	—	m	j	—	by May 29.
Erodium								
cicutarium	—	—	—	—	—	—	—	

Oxalidaceæ.

Oxalis								
Acetosella	—	—	—	a	m	—	—	April 19, J.S. and F.E.T
corniculata	—	—	—	—	—	—	—	

Linaceæ.

Linum								
usitatissimum	—	—	—	—	—	—	j	July 9, Mrs. Thompson.
cartharticum	—	—	—	—	m	jj	j	May 20, J.S.

CALYCIFLORÆ.

CELASTRACEÆ.								
Staphylea								
*pinnata	—	—	—	—	m	—	—	by May 12.
Euonymus								
europæus	—	—	—	—	m	j	—	May 27, G.W.D.L.
RHAMNACEÆ.								
Rhamnus								
catharticus	—	—	—	—	m	j	—	May 28, F.E.T.
LEGUMINOSÆ.								
Ulex								
europæus	h	h	h	a	mm	j	j	all the year.
nanus	—	—	—	—	—	—	—	
Genista								
tinctoria	—	—	—	—	—	jj	j	full fl. June 12, J.S.
anglica	—	—	—	—	—	—	—	
Sarothamnus								
scoparius	—	—	—	a	m	j	—	April 19, J.S. and F.E.T.
Ononis								
arvensis	—	—	—	—	—	jj	j	June 16, J.B.F. & G.H.P.
campestris	—	—	—	—	—	—	j	July 8, J.S.
Medicago								
sativa	—	—	—	—	—	j	j	June 30, S.F.T.
lupulina	—	—	—	a	mm	jj	j	April 18, J.S.
Melilotus								
officinalis	—	—	—	—	—	—	—	
Trifolium								
pratense	—	—	—	—	mm	jj	j	May 12, J.S. and F.E.T.
*incarnatum	—	—	—	—	mm	j	j	May 18, J.S.
arvense	—	—	—	—	—	—	—	
repens	—	—	—	—	m	jj	j	May 18, J.S.
hybridum	—	—	—	—	—	j	—	June 6.
*fragiferum	—	—	—	—	—	—	—	
procumbens	—	—	—	—	—	jj	j	June 7, J.S.
minus	—	—	—	—	m	j	j	May 14, F.E.T.
Lotus								
corniculatus	—	—	—	—	mm	jj	j	May 12, J.S. and F.E.T.
major	—	—	—	—	—	j	j	June 23, F.E.T.
Anthyllis								
vulneraria	—	—	—	—	m	jj	j	May 20, J.S.

Astragalus								
glycyphyllos ...	—	—	—	—	—	—	—	
Vicia								
hirsuta............	—	—	—	—	m	j	j	May 18, J.S. and F.E.T.
tetrasperma ...	—	—	—	—	?	j	—	by June 3, J.S.
gracilis	—	—	—	m	?	—	—	by May 27, J.S.
sylvatica.........	—	—	—	—	—	j	—	full fl. June 14, J.B.F. & G.H.P.
Cracca	—	—	—	—	—	jj	j	June 11, F.E.T.
sepium............	—	—	—	a	mm	jj	j	April 21, F.E.T.
sativa	—	—	—	a	m	jj	j	April 23, F.E.T.
(var) angustifolia	—	—	—	—	—	—	—	
Lathyrus								
Aphaca	—	—	—	—	—	j	j	June 17, J.S.
Nissolia	—	—	—	—	—	—	—	
pratensis.........	—	—	—	—	m	jj	j	May 21, F.E.T.
macrorrhizus ...	—	—	—	a	m	j	—	April 16, F.E.T.
Orobus								
*vernus............	—	—	—	a	—	—	—	April 10.
Hippocrepis								
comosa	—	—	—	—	m	j	j	May 23, F.E.T.
Onobrychis								
sativa	—	—	—	—	m	j	j	May 12, J.S.
Cytisus								
*Laburnum	—	—	—	—	m	—	—	May 18.
ROSACEÆ.								
Prunus								
communis								
var. spinosa ...	—	—	—	a	?	—	—	April 16, F.E.T.
var. insititia ...	—	—	—	a	?	—	—	April 18, F.E.T.
var. domestica	—	—	—	a	?	—	—	April 22, F.E.T.
*Padus	—	—	—	—	m	—	—	full fl. May 16.
Avium	—	—	—	a	?	—	—	April 25, F.E.T.
cerasus	—	—	—	*a	—	—	—	cult. April 12, G.W.D.L.
Spiræa								
Ulmaria	—	—	—	—	—	j	j	June 11, J.S.
Filipendula ...	—	—	—	—	—	j	j	full fl. June 26, J.S.
Sanguisorba								
officinalis	—	—	—	—	—	—	—	
Poterium								
sanguisorba ...	—	—	—	—	—	jj	j	May 12, J.S. and F.E.T.

Agrimonia								
Eupatoria	—	—	—	—	—	jj	j	June 11, J.B.G.
odorata	—	—	—	—	—	—	—	
Alchemilla								
vulgaris	—	—	—	—	m	j	—	May 12, F.E.T.
arvensis	—	—	(m)	—	m	—	—	March 24, May 14.
Sibbaldia								
***procumbens**	—	—	—	—	m	—	—	full fl. May 12.
Potentilla								
anserina	—	—	—	—	m	jj	j	May 12, J.S. & F.E.T.
reptans	—	—	—	—	—	jj	j	June 8, A.B.
Tormentilla	—	—	—	—	m	j	j	May 15, F.E.T.
fragariastrum	—	—	m	aa	m	—	—	March 16, F.E.T.
Fragaria								
vesca	—	—	(m)	—	m	j	j	March 29, J.S.; May 12, J.S. & F.E.T.
elatior	—	—	—	—	—	—	—	
Rubus								
Idæus	—	—	—	—	m	j	—	May 27, J.S.
rhamnifolius	—	—	—	—	—	—	—	
discolor	—	—	—	—	—	j	j	June 20, F.E.T.
leucostachys	—	—	—	—	—	—	—	
Radula	—	—	—	—	—	j	?	by June 24.
corylifolius	—	—	—	—	—	j	—	June 11, J.S.
tuberculatus	—	—	—	—	—	—	—	
cæsius	—	—	—	—	m	jj	j	May 21, F.E.T.
Geum								
urbanum	—	—	—	—	m	jj	j	May 12, F.E.T.
intermedium	—	—	—	—	—	—	—	
rivale	—	—	—	—	m	j	—	May 18, J.S.
***coccineum**	—	—	—	—	—	j	—	June 4.
Rosa								
tomentosa	—	—	—	—	—	j	j	June 11, J.S.
rubiginosa	—	—	—	—	—	—	—	
canina	—	—	—	—	m	jj	j	May 30, A.W.B., over July 15.
arvensis	—	—	—	—	—	j	j	June 14, J.S.
Cratægus								
Oxyacantha	—	—	—	—	mm	j	—	May 14, J.S. & F.E.T., over June 14.

Pyrus								
Malus	—	—	—	—	m	?	—	full fl. May 19, J.S.
var. acerba	—	—	—	—	m	?	—	full fl. May 21, J.S.
var. mitis	—	—	—	—	m	?	—	full fl. May 21, F.E.T.
***Aucuparia**	—	—	—	—	m	?	—	May 21, F.E.T.
Aria	—	—	—	—	—	—	—	
***Japonica**	—	—	m	?	—	—	—	by March 17.
***apricot**	—	—	m	?	—	—	—	March 23, G.W.D.L.
***apple**								
***pear**								
***plum**								
Kerria								
***Japonica**	—	—	—	a	?	—	—	April 11.
LYTHRACEÆ.								
Lythrum								
Salicaria	—	—	—	—	—	—	—	
Peplis								
Portula	—	—	—	—	—	—	—	
ONAGRACEÆ.								
Epilobium								
angustifolium	—	—	—	—	—	—	j	July 4, F.E.T.
hirsutum	—	—	—	—	—	—	j	July 2, J.S.
parviflorum	—	—	—	—	—	j	j	June 7, J.S. & F.E.T.
montanum	—	—	—	—	—	j	j	June 4.
palustre	—	—	—	—	—	—	j	July 2, J.S.
Circæa								
lutetiana	—	—	—	—	—	j	j	full bud June 20, H.H.W.
HALORAGACEÆ.								
Myriophyllum								
spicatum	—	—	—	—	—	j	—	June 6, J.S.
CUCURBITACEÆ.								
Bryonia								
dioica	—	—	—	—	m	j	j	May 23, F.E.T.
PORTULACEÆ.								
Montia								
fontana	—	—	—	—	—	—	—	
CRASSULACEÆ.								
Sedum								
***Rhodiola**	—	—	—	—	m	—	—	full fl. May 12.
Fabaria	—	—	—	—	—	—	—	not in fl. by end of July.
album	—	—	—	—	—	—	—	

acre	—	—	—	—	—	j	j	June 6, J.S.
reflexum	—	—	—	—	—	—	j	July 3, J.S.
Sempervivum								
*tectorum	—	—	—	—	—	—	j	July 15, F.E.T.
Ribesiaceæ.								
Ribes								
*Grossularia	—	—	—	a	—	—	—	April 4, F.E.T.
*nigrum	—	—	—	—	m	—	—	full fl. May 18, J.S.
*rubrum	—	—	—	a	—	—	—	April 17, F.E.T.
*sanguineum	—	—	—	a	—	—	—	April 10, G.W.D.L.
*aureum	—	—	—	a	?	—	—	April 18.
Saxifragaceæ.								
Saxifraga								
*umbrosa	—	—	—	—	m	j	—	May 20.
*hirsuta	—	—	—	—	m	j	—	by May 21.
*cæspitosa	—	—	—	—	m	j	—	May 20.
tridactylites	—	—	—	a	m	—	—	April 17, F.E.T.
granulata	—	—	—	a	m	j	—	April 27, J.S.
*crassifolia	—	—	—	a	m	—	—	April 6.
*Kamschatica	—	—	—	—	—	—	j	about July 15.
*incrustata	—	—	—	—	m	j	—	May 15.
Chrysosplenium								
oppositifolium	—	—	—	—	m	j	—	full fl. May 21, F.E.T.
Philadelphus								
*coronarius	—	—	—	—	—	j	—	June 7.
Umbelliferæ.								
Sanicula								
europæa	—	—	—	—	m	j	j	May 18, J.S.
Apium								
graveolens	—	—	—	—	—	j	?	bud June 10, J.S.
Helosciadium								
nodiflorum	—	—	—	—	—	j	?	June 28, G.W.D.L.
inundatum	—	—	—	—	—	j	—	fl. and seed June 17, J.S.
Sison								
Amomum	—	—	—	—	—	—	j	July 24, J.S.
Ægopodium								
Podagraria	—	—	—	—	m	j	j	May 27, J.S.
Bunium								
flexuosum	—	—	—	—	mm	jj	—	May 18, F.E.T.
Pimpinella								
saxifraga	—	—	—	(a)	m	j	j	April 17, F.E.T. May 16.

Sium								
angustifolium ...	—	—	—	—	—	j		June 28, F.E.T.
Œnanthe								
crocata	—	—	—	—	—	j	j	June 6, F.E.T.
fluviatilis.........	—	—	—	—	—	—	j	July 7, J.S. and F.E.T.
Æthusa								
Cynapium	—	—	—	—	—	j	j	June 11, J.S.
Fœniculum								
*officinale	—	—	—	—	—	—	j	full bud, July 15.
Haloscias								
*scoticum	—	—	—	—	—	—	—	
Silaus								
pratensis	—	—	—	—	—	j	j	June 21, F.E.T.
Angelica								
sylvestris.........	—	—	—	—	—	—		not in fl. by the end of July
Pastinaca								
sativa	—	—	—	(a)	m	j	j	April 19, J.S. & F.E.T. May 26.
Heracleum								
Sphondylium ...	—	—	—	—	m	jj	j	May 16, F.E.T.
Daucus								
Carota	—	—	—	—	—	j	j	June 11, F.E.T.
Torilis								
Anthriscus	—	—	—	—	—	j	j	June 21, J.S.
infesta	—	—	—	—	—	j	j	June 21, J.S.
nodosa	—	—	—	—	—	—	—	
Scandix								
Pecten-Veneris	—	—	—	(a)	m	j	j	April28, J.S. (Figheldean), May 12.
Anthriscus								
sylvestris...... ..	—	—	m	aa	mm	j	j	March 21, F.E.T.
Chærophyllum								
temulum.........	—	—	—	—	m	jj	j	May24,(Bicknoll); May28.
Conium								
maculatum	—	—	—	—	—	—	—	
HEDERACEÆ.								
Hedera								
Helix	—	—	—	—	—	—	—	
CORNACEÆ.								
Cornus								
sanguinea	—	—	—	—	—	jj	—	June 5, G.W.D L. over by June 30.

*mascula	—	—	m	a	—	—	—	March 6.

COROLLIFLORÆ.

CAPRIFOLIACEÆ.

Adoxa								
Moschatellina	—	—	m	a	m	—	—	March 21, F.E.T.
Sambucus								
nigra	—	—	—	—	m	jj	j	May 23, F.E.T.
Viburnum								
Lantana	—	—	—	—	mm	j	—	May 12.
Opulus	—	—	—	—	m	j	—	(barren) May 20, J.S., (fertile) May 29, H.G. and J.M.L.D.
*Laurustinus	—	—	m	a	m	?	—	March 1, G.W.D.L.
Lonicera								
*Caprifolium	—	—	—	—	—	—	—	
Periclymenum	—	—	—	—	—	jj	j	June 6, F.E.T.
Symphoricarpos								
*racemosus	—	—	—	—	—	j	j	June 10, F.E.T.

RUBIACEÆ.

Sherardia								
arvensis	—	—	—	a	m	j	—	April 28, F.E.T.
Asperula								
cynanchica	—	—	—	—	—	jj	j	June 6, J.S.
odorata	—	—	—	—	mm	j	—	May 12, J.S.
Galium								
cruciatum	—	—	—	a	m	j	—	April 18, F.E.T.
Aparine	—	—	—	a	mm	jj	j	April 28, F.E.T.
Mollugo	—	—	—	—	mm	jj	j	May 28, F.E.T.
verum	—	—	—	—	—	j	jj	June 17, F.E.T.
saxatile	—	—	—	—	—	j	—	June 11, J.S.
uliginosum	—	—	—	—	—	—	—	
palustre	—	—	—	—	—	jj	j	June 10, F.E.T.
var. Witheringii	—	—	—	—	—			

VALERIANACEÆ.

Valeriana								
officinalis	—	—	—	—	—	j	j	June 12, J.W.G.
dioica	—	—	—	—	m	j	—	May 12.
Valerianella								
olitoria	—	—	—	a	m	j	—	April 17, F.E.T.
dentata	—	—	—	—	—	j	—	June 12, J.S.

DIPSACEÆ.

Dipsacus								
sylvestris	—	—	—	—	—	—	—	young bud June 21, F.E.T.
pilosus	—	—	—	—	—	—	—	
Knautia								
arvensis	—	—	—	—	m	jj	j	May 28, F.E.T.
Scabiosa								
succisa............	—	—	—	—	—	—	—	not in fl. by July 27.
columbaria	—	—	—	—	—	j	j	June 12, J.W.G.

COMPOSITÆ.

Eupatorium								
cannabinum ...	—	—	—	—	—	—	j	July 9, G.W.D.L.
Petasites								
vulgaris	—	—	m	a	m	—	—	by March 12, F.E.T., J.S.
Tussilago								
Farfara	—	—	m	a	m	—	—	March 9, G.W.D.L.
Erigeron								
acris...............	—	—	—	—	m	j	j	May 21, F.E.T.
Bellis								
perennis	h	h	h	a	m	jj	j	all the year.
Solidago								
Virgaurea	—	—	—	—	—	—	—	
Inula								
*Helenium	—	—	—	—	—	j	j	
Conyza	—	—	—	—	—	—	—	
Pulicaria								
dysenterica ...	—	—	—	—	—	—	—	not by July 27; bud July 7.
Bidens								
tripartita.........	—	—	—	—	—	—	—	not by July 27.
cernua	—	—	—	—	—	—	—	ditto
Achillea								
Ptarmica.........	—	—	—	—	—	—	—	ditto
*tomentosa ...	—	—	—	—	m	j	j	May 29.
Millefolium......	—	—	—	—	m	jj	j	May 21, F.E.T.
Anthemis								
arvensis	—	—	—	—	—	j	j	full bud May 20, J.S.
Cotula............	—	—	—	—	—	j	—	June 6, FET.
nobilis	—	—	—	—	—	j	—	June 14.
Matricaria								
Parthenium ...	—	—	—	—	—	j	—	June 15, F.E.T.

inodora	—	—	—	a	m	j	j	April 27, J.S.; May 23, F.E.T.
Chamomilla	—	—	—	—	—	j	j	June 3, G.J.S.
Chrysanthemum								
Leucanthemum	—	—	—	—	m	jj	j	May 16, F.E.T.
segetum	—	—	—	—	—	j	j	June 9, F.E.T.
Artemisia								
*Absinthium	—	—	—	—	—	—	j	
vulgaris	—	—	—	—	—	—	j	July 18, G.W.D.L.
Tanacetum								
vulgare	—	—	—	—	—	—	—	
Filago								
germanica	—	—	—	—	—	j	j	June 24, J.S.
minima	—	—	—	—	—	—	—	
Gnaphalium								
uliginosum	—	—	—	—	—	—	j	July 8, J.S.
sylvaticum	—	—	—	—	—	—	—	not in fl. by July 27.
Doronicum								
*Pardalianches	—	—	—	—	m	—	—	May 15.
Senecio								
vulgaris	h	h	h	a	m	jj	j	all the year.
erucifolius	—	—	—	—	—	—	—	bud July 7, F.E.T.
Jacobæa	—	—	—	—	m	jj	j	May 28, F.E.T.
aquaticus	—	—	—	—	—	j	j	June 6, J.S.
campestris	—	—	—	—	m	?	—	May 20, J.S.
Carlina								
vulgaris	—	—	—	—	—	—	j	July 15, J.S. & G.W.D.L.
Arctium								
majus	—	—	—	—	—	—	j	July 15, J.S.
nemorosum	—	—	—	—	—	—	j	July 9, J.S.
intermedium	—	—	—	—	—	—	—	
Serratula								
tinctoria	—	—	—	—	—	j	—	June 26, R.E.D.
Centaurea								
nigra	—	—	—	—	—	jj	j	June 11, F.E.T.
Cyanus	—	—	—	—	—	j	j	June 9, F.E.T.
Scabiosa	—	—	—	—	—	jj	j	June 9, F.E.T.
Onopordum								
Acanthium	—	—	—	—	—	—	—	
Carduus								
nutans	—	—	—	—	—	jj	j	June 12, J.S.

crispus	—	—	—	—	m	jj	j	May 15, P.L.H.
lanceolatus	—	—	—	—	—	—	j	July 1, J.S.; G.W.D.L.
eriophorus	—	—	—	—	—	—	j	July 23, J.S.
arvensis	—	—	—	—	—	j	j	June 23.
palustris	—	—	—	—	m	jj	j	May 22, F.E.T.
pratensis	—	—	—	—	—	—	—	
tuberosus	—	—	—	—	—	—	—	
acaulis	—	—	—	—	—	j	j	about June 14, G.W.D.L.
Silybum								
*marianum	—	—	—	—	—	j	?	June 16.
Lapsana								
communis	—	—	—	—	—	jj	j	June 11, J.S.
Cicherium								
Intybus	—	—	—	—	—	—	—	
Hypochœris								
radicata	—	—	—	—	m	jj	j	May 18, J.S.
Apargia								
hispida	—	—	—	—	m	jj	j	May 18, J.S.
autumnalis	—	—	—	—	—	j	j	June 6.
Tragopogon								
minor	—	—	—	—	m	j	j	May 28, F.E.T.
Picris								
hieraciordes	—	—	—	—	—	—	j	July 15, G.W.D.L.
Helminthia								
echiordes..	—	—	—	—	—	—	—	
Leontodon								
Taraxacum	h	h	h	aa	mm	jj	j	All the year
Sonchus								
oleraceus	—	—	—	—	—	j	—	June 15, F.E.T.
asper	—	—	—	—	—	jj	j	June 5, J.S.
arvensis	—	—	—	—	—	j	—	bud June 17, J.S.
Mulgedium								
*alpinum	—	—	—	—	—	j	—	June 19
Crepis								
virens	—	—	—	—	m	jj	j	May 12, J.S.
biennis	—	—	—	—	—	—	—	
Hieracium								
Pilosella	—	—	—	—	m	jj	j	May 16, F.E.T.
*aurantiacum	—	—	—	...	—	j	—	June 5
murorum	—	—	—	—	—	—	—	
vulgatum	—	—	—	—	—	j	j	June 20, F.E.T.

boreale	—	—	—	—	—	—	—	
CAMPANULACEÆ.								
Jasione								
montana	—	—	—	—	—	—	—	
Phyteuma								
orbiculare	—	—	—	—	—	—	—	
Campanula								
glomerata	—	—	—	—	—	j	j	June 14, M.B.
*latifolia	—	—	—	—	m	j	—	
Trachelium	—	—	—	—	—	—	j	by July 10, J.S.
rotundifolia ...	—	—	—	—	—	j	j	June 18, J.S.
Specularia								
hybrida	—	—	—	—	m	?	—	by May 27, J.S.
ERICACEÆ:								
Calluna								
vulgaris	—	—	—	—	—	—	—	
Monotropa								
Hypopitis	—	—	—	—	—	—	—	
AQUIFOLIACEÆ.								
Ilex								
Aquifolium	—	—	—	—	m	j	—	May 18, F.E.T.
JASMINACEÆ.								
Ligustrum								
vulgare	—	—	—	—	—	j	j	June 12, T.F.W.
Fraxinus								
excelsior	—	—	—	a	—	—	—	April 10, C.A.S. (Alton); April 18. F.E.T.
Syringa								
*vulgaris	—	—	—	—	m	j	—	
APOCYNACEÆ.								
Vinca								
minor	—	—	m	a	m	—	—	March 10, F.E.T.
major	—	—	—	a	m	—	—	*April 8; (wild) April 25, F.E.T.
GENTIANACEÆ.								
Erythræa								
Centaurium......	—	—	—	—	—	j	j	June 20, F.E.T.
Gentiana								
Amarella.........	—	—	—	—	—	—	—	
campestris	—	—	—	—	—	—	—	

Menyanthes								
trifoliata	—	—	—	—	a	m	j	April 26, F.E.T.
POLEMONIACEÆ.								
Polemonium								
cæruleum	—	—	—	—	—	j	j	June 13, F.E.T.
CONVOLVULACEÆ.								
Convolvulus								
arvensis	—	—	—	—	—	jj	j	June 3, G.J.S.
sepium	—	—	—	—	—	j	j	June 21
Cuscuta								
Trifolii	—	—	—	...	—	—	j	bud June 25. S.C.V.F.
BORAGINACEÆ.								
Cynoglossum								
officinale	—	—	—	—	—	m	j	May 24, G.W.D.L.
Borago								
*officinalis	—	—	—	—	—	—	j	
Lycopsis								
arvensis	—	—	—	—	—	j	j	June 6, J.S.
Symphytum								
officinale	—	—	—	a	mm	jj	j	April 21, F.E.T.
asperrimum	—	—	—	—	—	j	—	June 5, H.J.W
Echium								
vulgare	—	—	—	—	—	j	j	full fl. June 20, F.E.T.
Pulmonaria								
*officinalis	—	—	—	a	m	—	—	April 1
Lithospermum								
officinale	—	—	—	—	m	j	—	May 23, G.W.D.L.
arvense	—	—	—	—	m	j	j	May 20, J.S.
Myosotis								
palustris	—	—	—	—	m	jj	j	May 21, F.E.T.
arvensis	—	—	—	a	m	jj	j	April 26, F.E.T.
collina	—	—	—	a	m	j	—	April 19, J.S. & F.E.T.
versicolor	—	—	—	—	m	j	—	by May 18, J.S.
SOLANACEÆ.								
Solanum								
Dulcamara	—	—	—	—	m	jj	j	May 30, J.S.
*tuberosum	—	—	—	—	—	j	j	June 9, F.E.T.
Atropa								
*Belladonna	—	—	—	—	m	j	—	May 29
Hyoscyamus								
niger	—	—	—	—	—	—	—	

Lycium								
*barbarum	—	—	—	—	m	j	j	May 12, J.S.
OROBANCHACEÆ.								
Orobanche								
elatior	—	—	—	—	—	j	j	June 28, G.W.D.L.
minor	—	—	—	—	—	j	j	June 10, J.S.
Lathræa								
squamaria	—	—	—	a	?	—	—	April 26, F.E.T.
SCROPHULARIACEÆ.								
Verbascum								
Thapsus	—	—	—	—	—	j	j	June 19, J.S.
nigrum	—	—	—	—	—	—	j	July 3, J.S.
Digitalis								
*purpurea	—	—	—	—	—	j	—	
Antirrhinum								
*majus	—	—	—	—	—	—	—	
Linaria								
Cymbalaria	—	—	—	a	m	j	?	April 26, F.E.T.
spuria	—	—	—	—	—	—	—	
minor	—	—	—	—	m	j	j	May 30, W.M.
vulgaris	—	—	—	—	—	j	j	June 11, J.S.
Scrophularia								
nodosa	—	—	—	—	m	j	j	May 29, S.F.C. & H.S.D.
aquatica	—	—	—	—	—	j	j	June 10, F.E.T.
*vernalis	—	—	—	a	m	—	—	April 17.
Melampyrum								
pratense	—	—	—	—	m	jj	j	May 27, J.S.
Pedicularis								
palustris	—	—	—	—	—	—	j	by July 15, F.E.T.
sylvatica	—	—	—	—	m	j	j	May 13, F.E.T.
Rhinanthus								
Crista-galli	—	—	—	—	m	j	—	May 26, F.E.T.
Euphrasia								
officinalis	—	—	—	—	—	j	—	June 17, F.E.T.
Odontites	—	—	—	—	—	j	j	June 25, J.S. & F.E.T.
Veronica								
scutellata	—	—	—	—	m	j	—	by May 30, F.E.T.
anagallis	—	—	—	—	m	j	j	May 28.
Beccabunga	—	—	—	—	m	jj	j	May 17, F.E.T.
chamædrys	—	—	—	a	mm	jj	j	April 17, F.E.T.
officinalis	—	—	—	—	—	j	j	June 3, J.S.

serpyllifolia	—	—	—	a	m	j	—	April 26, F.E.T.
arvensis	—	—	—	—	m	j	—	May 19, J.S.
agrestis	—	—	—	a	?	—	—	April 22, J.S.
polita	h	h	h	a	m	j	j	all the year.
Buxbaumii	h	h	h	a	m	j	j	all the year.
hederifolia	—	f	mm	a	m	j	j	Feb. 8, J.S.
LABIATÆ.								
Mentha								
rotundifolia	—	—	—	—	—	—	—	
aquatica	—	—	—	—	—	—	—	
sativa	—	—	—	—	—	—	j	July 15, G.W.D.L.
arvensis	—	—	—	—	—	—	—	
Pulegium	—	—	—	—	—	—	—	
Lycopus								
europæus	—	—	—	—	—	—	—	
Salvia								
verbenaca	—	—	—	—	m	j	—	May 14, J.S. & F.E.T.
Origanum								
vulgare	—	—	—	—	—	—	j	July 16, F.E.T.
Thymus								
serpyllum	—	—	—	—	m	jj	j	May 26, F.E.T.
Calamintha								
officinalis	—	—	—	—	—	—	—	
Acinos	—	—	—	—	—	—	j	July 4, G.W.D.L.
Clinopodium	—	—	—	—	—	j	j	June 21, T.
Scutellaria								
galericulata	—	—	—	—	—	j	j	June 13, F.E.T.
Prunella								
vulgaris	—	—	—	—	—	jj	jj	June 6, F.E.T.
Nepeta								
Glechoma	—	—	m	aa	mm	jj	j	March 23, F.E.T.
Lamium								
amplexicale	h	h	h	a	m	j	—	all the year.
purpureum	h	h	h	a	m	j	j	all the year.
album	—	—	(m)	a	mm	jj	j	March 27, G.W.D.L.
* maculatum	—	—	—	a	mm	?	—	April 3.
Galeobdolon	—	—	—	a	mm	j	—	April 26, F.E.T.
Leonurus								
* Cardiaca	—	—	—	—	—	j	—	
Galeopsis								
Ladanum	—	—	—	—	—	—	j	July 1, J.S.

Tetrahit	—	—	—	—	—	j	j	June 21, J.S.
Stachys								
Betonica	—	—	—	—	—	j	j	June 21, J.S.
sylvatica	—	—	—	—	—	jj	j	June 5, H.J.W.; J.S.
palustris	—	—	—	—	—	—	j	July 2, J.S.
Ballota								
fœtida	—	—	—	—	—	j	j	June 17, F.E.T.
Teucrium								
Scorodonia	—	—	—	—	—	—	—	
Ajuga								
reptans	—	—	—	a	mm	jj	j	April 26, F.E.T.
VERBENACEÆ.								
Verbena								
officinalis.........	—	—	—	—	—	j	j	June 28, F.E.T.
PRIMULACEÆ.								
Primula								
vulgaris	—	f	m	a	m	—	—	Feb. 22, J.S. (? hybernated)
var. variabilis ...	—	—	—	a	—	—	—	April 12, F.E.T.
veris..............	—	—	—	a	m	j	—	April 3, C.W.T. Ap. 10, E.W.M.L. and C.S.
Lysimachia								
Nummularia ...	—	—	—	—	—	j	j	June 23, F.E.T.
nemorum.........	—	—	—	—	m	j	j	May 28, F.E.T.
Anagallis								
arvensis	—	—	—	—	m	j	j	May 20, J.S.
Dodecatheon								
* meadea.........	—	—	—	—	—	—	—	
PLANTAGINACEÆ.								
Plantago								
lanceolata	—	—	—	a	mm	jj	j	April 16, F.E.T.
media	—	—	—	—	m	jj	j	May 12.
major	—	—	—	—	—	jj	j	June 2, W.M.

MONOCHLAMYDEÆ.

CHENOPODIACEÆ.								
Chenopodium								
album	—	—	—	—	—	j	j	June 13, F.E.T.
var. viride	—	—	—	—	—	—	j	July 2, J.S.
rubrum	—	—	—	—	—	—	—	
Bonus-Henricus	—	—	—	a	m	j	j	by April 25, J.S.

triplex								
angustifolia……	—	—	—	—	—	j	j	June 24, J.S.
deltoidea………	—	—	—	—	—	—	—	
hastata ………	—	—	—	—	—	—	—	
POLYGONACEÆ.								
Rumex								
conglomeratus	—	—	—	—	—	j	j	bud June 17, J.S.
sanguineus ……	—	—	—	—	—	—	j	July 4, F.E.T.
obtusifolius ……	—	—	—	—	—	jj	jj	June 5, F.E.T.
crispus…………	—	—	—	—	—	j	j	June 10, F.E.T.
Hydrolapathum	—	—	—	—	—	—	j	July 9, F.E.T.
Acetosa ………	—	—	—	—	m	jj	—	May 18, F.E.T.
Acetosella ……	—	—	—	—	m	j	—	May 16, F.E.T.
Polygonum								
Bistorta ………	—	—	—	—	m	j	—	May 21, J.H.G.
amphibium ……	—	—	—	—	—	j	j	June 10, J.S.
lapathifolium …	—	—	—	—	—	—	j	July 2, J.S.
Persicaria ……	—	—	—	—	—	j	j	June 7, J.S.
Hydropiper……	—	—	—	—	—	—	—	
aviculare………	—	—	—	—	m	jj	jj	May 30, J.S.
Convolvulus …	—	—	—	—	—	jj	j	June 11, J.S.
THYMELACEÆ.								
Daphne								
*Mezereum ……	—	—	m	a	—	—	—	about March 27, J.S.
Laureola………	—	f	m	—	—	—	—	Feb. 11.
SANTALACEÆ.								
Thesium								
humifusum……	—	—	—	—	—	—	—	
EUPHORBIACEÆ.								
Buxus								
*sempervirens …	—	—	m	a	—	—	—	March 17, F.E.T.
Euphorbia								
Helioscopia……	—	—	—	a	m	j	j	April 12, G.W.D.L.
amygdaloides …	—	—	—	—	m	j	—	May 12,
Peplus…………	—	—	—	a	—	j	j	April 8, FET. June 12, F.E.T.
exigua…………	—	—	—	—	—	j	j	June 20, F.E.T.
Mercurialis								
perennis………	—	—	m	aa	mm	j	—	March 3 J.S.
CALLITRICHACEÆ.								
Callitriche								

verna	—	—	—	a	m	—	—	April 19, J.S. & F.E.T.
hamulata	—	—	—	—	—	—	—	
URTICACEÆ.								
Urtica								
urens	—	—	—	—	m	j	j	May 24, J.S. & F.E.T.
dioica	—	—	—	—	m	jj	j	nearly out May 18, J.S.
Humulus								
lupulus	—	—	—	—	—	—	—	
ULMACEÆ.								
Ulmus								
suberosa	—	—	—	—	—	—	—	
montana	—	—	—	a	—	—	—	April 1, F.E.T.
AMENTIFERÆ.								
Salix								
alba	—	—	—	—	—	—	—	
triandra	—	—	—	a	m	—	—	April 14, F.E.T.
purpurea	—	—	—	—	—	—	—	
rubra	—	—	—	—	—	—	—	
viminalis	—	—	—	a	?	—	—	by April 14, F.E.T.
caprea	—	—	m	a	—	—	—	March 21 F.E.T.
fusca	—	—	—	—	—	—	—	
Populus								
alba	—	—	—	—	—	—	—	
nigra	—	—	m	a	—	—	—	March 22, and 29 J.S.
*fastigita	—	—	—	—	—	—	—	
Betula								
glutinosa	—	—	—	a	—	—	—	April 18, F.E.T.
Alnus								
glutinosa	—	—	—	—	m	?	—	(bud) May 24, J.S. & F.E.T.
Fagus								
sylvatica	—	—	—	—	—	—	—	no flowers could be found
Castanea								
vulgaris	—	—	—	—	—	—	j	July 16, F.E.T.
Quercus								
Robur	—	—	—	—	m	—	—	May 18, J.S. & F.E.T.
Corylus								
Avellana	—	f	m	aa	—	—	—	fertile by Feb. 10, barren Feb. 26.
Juglans								
*regia	—	—	—	—	m	—	—	May 22,

Carpinus								
betulus	—	—	—	a	—	—	—	April 26, F. E. T.

GYMNOSPERMEÆ.

Coniferæ.

Taxus								
baccata	—	—	m	—	—	—	—	March 12, F.E.T.
Juniperus								
communis	—	—	—	a	—	—	—	April 25, F.E.T.
Pinus								
sylvestris	—	—	—	—	—	j	—	by June 5, J.S. & F.E.T.
Larix								
*europæa	—	—	m	a	—	—	—	March 26.

MONOCOTYLEDONS.

Trilliaceæ.

Paris								
quadrifolia	—	—	—	—	m	—	—	full fl. May 18, W.G.

Dioscoreaceæ.

Tamus								
communis	—	—	—	—	m	jj	j	May 30, J.S.

Hydrocharidaceæ.

Anacharis								
Alsinastrum ...	—	—	—	—	—	j		by June 6.

Orchidaceæ.

Orchis								
Morio	—	—	—	—	m	j	—	May 12, F.E.T.
mascula	—	—	—	a	m	j	—	April 19 J.S. & F.E.T.
ustulata	—	—	—	—	m	—	—	May 29, J.S.
maculata	—	—	—	—	m	jj	j	May 30, J.S.
latifolia	—	—	—	—	—	—	j	full fl. July 15, F.E.T.
incarnata	—	—	—	—	m	j	—	May 26, J.S.
pyramidalis ...	—	—	—	—	—	j	j	June 18, J.S.
Gymnadenia								
conopsea	—	—	—	—	—	jj	—	June 14, J.S.
Habenaria								
viridis	—	—	—	—	—	—	—	
bifolia	—	—	—	—	—	—	—	
chlorantha	—	—	—	—	m	j	j	May 21. J.S.
Ophrys								
apifera............	—	—	—	—	—	—	—	

Spiranthes								
autumnalis	—	—	—	—	—	—	—	
Listera								
ovata	—	—	—	—	m	j	j	May 20, G.W.D.L.
Neottia								
Nidus-avis	—	—	—	—	?	j	j	full fl. June 11, J.B.F. and G.H.P.
Epipactis								
latifolia	—	—	—	—	—	—	j	July 24, J.S.
Cephalanthera								
grandiflora	—	—	—	—	—	—	—	
IRIDACEÆ.								
Iris								
Pseud-acorus	—	—	—	—	m	jj	j	May 30, F.E.T.
fœtidissima......	—	—	—	—	—	j	j	June 26.
Crocus								
***aureus ....**	—	—	f	m	a	—	—	Feb. 11 over April 12.
AMARYLLIDACEÆ.								
Narcissus								
biflorus	—	—	—	—	—	—	—	
Pseudo-narcissus	—	—	m	aa	—	—	—	March 25, F.E.T.
Leucojum								
***æstivum ....**	—	—	—	—	—	—	—	
Galanthus								
nivalis	—	f	mm	—	—	—	—	*Feb. 11.
ASPARAGACEÆ.								
Convallaria								
***majalis ....**	—	—	—	—	—	—	—	
Polygonatum								
multiflorum......	—	—	—	—	m	j	—	May 12, F.E.T
Ruscus								
aculeatus........	—	—	m	a	—	—	—	March 5, F.E.T.
LILIACEÆ.								
Tulipa								
sylvestris........	—	—	—	a	—	—	—	April 19, (Alton) C.A.S.
Fritillaria								
***Meleagris........**	—	—	—	a	—	—	—	April 18
***Imperialis ......**	—	—	—	a	—	—	—	April 12.
Ornithogalum......								
umbellatum ...	—	—	—	—	m	j	—	May 26, (Alton) C.A.S.

Scilla								
*bifolia	—	—	—	—	—	—	—	
*sibirica	—	—	m	—	—	—	—	March 6.
*amœna	—	—	m	—	—	—	—	March 10.
Allium								
vineale	—	—	—	—	—	j	—	June 21.
ursinum	—	—	—	—	m	j	—	full fl. May 20, J.S.
Endymion								
nutans	—	—	—	a	mm	j	—	April 22, F.E.T.
Muscari								
*botryoides ?	—	—	—	a	—	—	—	by April 15.
COLCHICACEÆ.								
Colchicum								
autumnale	—	—	—	—	—	—	—	
JUNCACEÆ.								
Juncus								
effusus	—	—	—	—	—	—	j	July 9.
conglomeratus	—	—	—	—	—	—	—	
glaucus	—	—	—	—	—	j	j	June 25, J.S. & F.E.T.
diffusus	—	—	—	—	—	—	j	July 6.
obtusiflorus	—	—	—	—	—	—	j	July 6.
acutiflorus	—	—	—	—	—	—		July 9.
lamprocarpus	—	—	—	—	—	j	j	June 25, J.S. & F.E.T.
bufonius	—	—	—	—	—	—	—	
Luzula								
pilosa	—	—	—	a	m	—	—	April 11, F.E.T.
campestris	—	—	—	a	m	j	—	April 19, J.S. & F.E.T.
ALISMACEÆ.								
Alisma								
Plantago	—	—	—	—	—			June 17, J.S.
Sagittaria								
sagittifolia	—	—	—	—	—	—	j	July 5, J.S.
Butomus								
umbellatus	—	—	—	—	—	j	j	June 28, F.E.T.
Triglochin								
palustre	—	—	—	—	—	—	—	
TYPHACEÆ.								
Typha								
latifolia	—	—	—	—	—	—	—	
Sparganium								
ramosum	—	—	—	—	—		j	June 17, J.S.

simplex	—	—	—	—	—	—	j	July 8, J.S.
ARACEÆ.								
Arum								
maculatum	—	—	—	a	m	—	—	April 16, F.E.T. (spathe no open)
LEMNACEÆ.								
Lemna								
minor	—	—	—	—	—	—	—	
gibba	—	—	—	—	—	—	—	
polyrrhiza	—	—	—	—	—	—	—	
POTAMOGETONACEÆ.								
Potamogeton								
natans	—	—	—	—	m	—	—	full fl. May 28, F.E.T.
lucens	—	—	—	—	—	—	—	
perfoliatus	—	—	—	—	—	j	—	June 17, J.S.
crispus............	—	—	—	—	—	—	—	
compressus	—	—	—	—	—	j	—	by June 6.
pectinatus	—	—	—	—	—	j	—	by June 6.
densus	—	—	—	—	m	j	—	May 28.
Zannichellia								
palustris	—	—	—	—	—	—	—	
CYPERACEÆ.								
Eleocharis								
palustris	—	—	—	—	m	j	j	full fl. May 28, F.E.T.
Scirpus								
lacustris	—	—	—	—	—	j	—	bud June 3, J.S.
Carex								
pulicaris	—	—	—	—	P	—	—	seed June 9.
vulpina	—	—	—	—	m	j	—	May 21, F.E.T.
divulsa	—	—	—	—	m	j	—	May 20, J.S.
paniculata	—	—	—	—	m	j	—	May 18, J.S.
remota............	—	—	—	—	—	j	—	
ovalis	—	—	—	—	—	—	—	
pendula	—	—	—	—	m	—	—	full fl. May 22.
præcox	—	—	—	—	m	—	—	May 13, J.S. & F.E.T.
pilulifera	—	—	—	—	m	—	—	May 26, F.E.T.
glauca	—	—	—	—	m	j	—	May 12, J.S. & F.E.T.
sylvatica	—	—	—	—	m	j	—	May 18, J.S.
hirta	—	—	—	—	m	j	j	full fl. May 28, F.E.T.
paludosa	—	—	—	—	m	j	—	May 14.

riparia	—	—	—	—	m		—	May 14.
GRAMINEÆ.								
Phalaris								
arundinacea	—	—	—	—	—	jj	j	June 3, J S.
Anthoxanthum								
odoratum	—	—	—	—	mm	j	j	May 12.
Phleum								
pratense	—	—	—	—	—	jj	j	June 14 F.E.T.
Alopecurus								
pratensis	—	—	—	a	mm	jj	j	April 19, J.S. & F.E.T.
geniculatus	—	—	—	—	m	j	—	May 27, J.S.
agrestis	—	—	—	—	m	j	j	May 18, F.E.T.
Milium								
effusum	—	—	—	—	m	j	—	May 18, F.E.T.
Phragmites								
communis	—	—	—	—	—	—	—	
Agrostis								
vulgaris	—	—	—	—	—	j	j	June 24, J.S.
alba	—	—	—	—	—	j	j	June 23, F.E.T.
Holcus								
lanatus	—	—	—	—	m	jj	j	May 21, F.E.T.
mollis	—	—	—	—	—	j	j	June 14, F.E.T.
Aira								
cæspitosa	—	—	—	—	—	j	j	June 13, F.E.T.
flexuosa	—	—	—	—	—	—	—	
caryophyllea	—	—	—	—	—	—	—	
Trisetum								
flavescens	—	—	—	—	—	jj	(j)	June 7.
Avena								
pratensis	—	—	—	—	m	j	(j)	May 20, J.S.
pubescens	—	—	—	—	m	j	—	May 18, J.S. & F.E.T.
Arrhenatherum								
avenaceum	—	—	—	—	m	jj	j	May 21, F.E.T
Kœleria								
cristata	—	—	—	—	j	—	—	June 2.
Melica								
uniflora	—	—	—	—	m	j	—	May 21, J.S.
Poa								
annua	h	h	h	a	m	j	j	all the year.
nemoralis	—	—	—	—	—	—	—	
trivialis	—	—	—	—	mm	jj	j	May 19, J.S.

pratensis	—	—	—	a	mm	j	j	April 19, J.S. & F.E.T.
Glyceria								
aquatica	—	—	—	—	—	j	j	June 11, F.E.T.
fluitans	—	—	—	—	m	j	j	by May 27, J.S.
plicata	—	—	—	—	m	j	j	by May 26, J.S.
Sclerochloa								
rigida	—	—	—	—	—	—	—	
Briza								
media	—	—	—	—	m	jj	j	May 25, J.S. F.E.T.
Catabrosa								
aquatica	—	—	—	—	j	—	—	by June 7, J.S.
Cynosurus								
cristatus	—j	—	—	—	m	jj	j	May 26, F.E.T. May 24, (Bicknoll)
Dactylis								
glomerata	—	—	—	—	m	jj	j	May 14, J.S. and F.E.T.
Festuca								
sciuroides	—	—	—	—	—	j	—	June 7, J.S.
ovina	—	—	—	—	m	j	—	May 19, J.S.
rubra	—	—	—	—	m	j	—	May 18, F.E.T.
gigantea	—	—	—	—	—	j	j	June, 21, F.E.T.
arundinacea ...	—	—	—	—	—	j	—	June 6.
pratensis.........	—	—	—	—	—	j	—	June 17, J S.
var. loliacea ...	—	—	—	—	—	j	—	
Bromus								
erectus............	—	—	—	—	m	jj	—	May 18, F.E.T.
asper	—	—	—	—	—	j	j	June 9.
sterilis............	—	—	—	—	mm	jj	(j)	May 12, J.S. and F.E.T.
Serrafalcus								
secalinus.........	—	—	—	—	—	—	—	
racemosus	—	—	—	—	—	—	—	
commutatus ...	—	—	—	—	—	—	—	
mollis	—	—	—	—	mm	jj	j	May 12, J.S. and F.E.T.
Brachypodium								
sylvaticum	—	—	—	—	—	—	—	
Triticum								
caninum	—	—	—	—	—	—	—	
repens	—	—	—	—	—	j	j	June 9, F.E
Hordeum								
pratense	—	—	—	—	—	j	j	fall fl. n 21, F.E.T.
murinum.........	—	—	—	—	—	—	—	

Lolium								
perenne	—	—	—	—	m	jj	j	May 12.
Rye	—	—	—	—	—	—	—	May 20, F.E.T.
Wheat	—	—	—	—	—	—	—	ears appearing June 9, F.E.T
Oats	—	—	—	—	—	—	—	June 6, F.E.T.
Barley	—	—	—	—	—	—	—	June 13, F.E.T.

CRYPTOGAMS.

EQUISETACEÆ.								
Equisetum								
arvense	—	—	—	a	m	—	—	April 16, F.E.T.
maximum	—	—	—	?	—	—	—	
sylvaticum	—	—	—	?	—	—	—	
limosum	—	—	—	a	m	j	j	April 18, F.E.T. (nearly open)
palustre	—	—	—	—	m	j	j	May 28, F.E.T.
FILICES.								
Polypodium								
vulgare								
Lastrea								
Oreopteris								
Filix-mas	—	—	—	—	—	—	—	1 ft. high May 18, J.S.
dilatata								
Polystichum								
aculeatum								
Athyrium								
Filix-fœmina								
Asplenium								
Adiantum-nigrum								
Trichomanes								
Ruta-muraria								
Scolopendrium								
vulgare								
Blechnum								
boreale								
Pteris								
aquilina								
Botrychium								
lunaria............	—	—	—	—	m	j	—	May 15, J.B.O.
Ophioglossum								
vulgatum								

NEW LOCALITIES, &c.

Myosurus minimus	Huish, J.S.
Ranunculus trichophyllus	Canal between Pewsey and Oare, J.S.
R. hederaceus	Bedwyn, J.S. This locality, though recorded in the Flora of Marlborough, has never been confirmed till this year.
R. Flammula	Pond West of Chisbury, J.S.
R. sceleratus	Bicknoll J.S. and F.E.T.
Papaver Argemone	Martinsell, J.S. Huish, J.S.
P. Lecoqii	Poulton, F.E.T.
Senebiera coronopus	Avebury, F.E.T.; Field near Cricket Field, Marlborough College.
Armoracia rusticana	Fyfield, J.S.
Arabis hirsuta	Overton, J.S.
Nasturtium palustre	Avebury, F.E.T.
Erysimum cheiranthoides	(Small, but apparently wild) Avebury, F.E.T.
Raphanus Raphanistrum	Oare, J.S.
Reseda lutea	Rockley, J.B.G.; Broad Hinton, F.E.H.
Viola Reichenbachiana	Rabley, F.E.T.
Stellaria uliginosa	Common in marshy spots.
Geranium columbinum	Stitchcomb, J.S.
G. lucidum	Stitchcomb, J.S.
Sarothamnus scoparius	Near the Wan's Dyke; A.A.G.; Pewsey, J.S. Savernake, F.E.T.
Genista tinctoria	Overton, J.S.; Field near Martinsell, J.S.; Bedwyn Common, J.S.; Bedwyn Brails, F.E.T.
Ononis campestris	Oare Hill, J S.
Medicago sativa	Field behind Barton Farm, S.F.T.
Vicia sativa	White var. near Oare, J.S.
V. tetrasperma	Woodborough, F.E.T.; Stitchcomb, J.S.
V. gracilis	Pewsey, J.S.
Prunus cerasus	Wan's Dyke, near the Pewsey Road.
Spiræa Filipendula	Overton, J.S.
Rubus Radula	Manton Copse.
R. corylifolius	near the Railway Station, Marlborough; Mildenhall.
Pyrus Aria	Bicknoll, J.B.G.
Epilobium angustifolium	Copse near Wilcot, J.S.; Avebury, F.E.T.

E. palustre	New Mill, J.S.; Wilcot, J.S.; between Savernake and Bedwyn, J.S. & G.W.D.L.
Circæa lutetiana	Wilcot, J.S.; Savernake, J.S.; Bedwyn, J.S. and F.E.T.; Bicknoll, J.B.G.
Chrysosplenium oppositifolium	Wootton Rivers, F.E.T.
Apium graveolens	New Mill, J.S.
Helosciadium inundatum	Pond near Chisbury, J.S.
Silaus pratensis	Ogbourn, G.W.D.L,; Silbury, F.E.T.
Torilis infesta	Wilcot; Woodborough, J.S.; Bedwyn, J.S. and G.W.D.L.
Asperula cynanchica	Generally distributed.
Valeriana dioica	Bedwyn, Huish, Elcott Mill, Axford.
Valerianella olitoria	Huish. Clatford, J.S.
V. dentata	Overton, J.S.
Hieracium boreale	Oare, J.S.; Bedwyn, J.S.; F.E.T. G.W.D.L. Mildenhall Borders, J.S. and F.E.T.
Serratula tinctoria	Near the Workhouse, Marlborough, R.E.D.
Carduus crispus	White var. Preshute, A.B.
C. eriophorus	Bicknoll, J.S. and F.E.T.; Vale behind Ivy's Farm F.E.T.
Centaurea nigra	White var. New Mill, J.S.
C. Cyanus	New Mill, J.S.
Senecio campestris	Martinsell, J.S. Broad Hinton, J.B.G.
Specularia hybrida	Half-a mile E. of Oare, J.S.
Menyanthes trifoliata	Water meadows above Stitchcomb, J.S.
Polemonium cæruleum	Pewsey, F.E.T.; Woodborough, J.S.; F.E.T. Savernake, J.S.
Cuscuta trifolii	Martinsell, S.C.V.F.
Melampyrum pratense	White Horse Down, J.M.L.D.
Linaria minor	Overton, J.S.; Railway bank at Marlborough Station and Granham Hill, J.S.
Orobanche elatior	Row Down, A.B.; Ogbourne, G.W.D.L.; Overton, J.S.
O. minor	Branched specimen, A.B.; specimen growing on *Carduus arvensis* A.B.
Verbena officinalis	Axford, F.E.T. Between Chisbury and Bedwyn, J.S.
Salvia Verbenaca	Mildenhall.
Ajuga reptans	white var. J.B.F. and E.L.H.
Echium vulgare	Bedwyn Brails F.E.T.
Lysimmachia Nummularia	Common in the Water Meadows.

Chenopodium viride	New Mill, J.S.
C. Bonus Henricus...	Railway Station, Marlborough, J.S., Bicknoll, J.S. & F.E.T., Mildenhall.
Polygonum Bistorta	Woodborough, J.S.
Orchis incarnata	Great Bedwyn, F.E.T.
Gymnadenia conopsea	Rainscombe, J.S. ; Silbury, F.E.T.
Tulipa sylvestris	Honey Street, C.A.S.
Allium vineale	Row Down, A.B. ; Near Barton Farm, S.F.T.
A. ursinum	Bicknoll, J.B.G. ; Woodborough, J.S.
Ornithogalum umbellatum ...	Manton, W.H.K.W.
Paris quadrifolia	Bicknoll.
Sagittaria sagittifolia	Wilcot, J.S.
Butomus umbellatus	Wilcot, J.S. : Marlborough Water Meadows, S.F.T.
Sparganium simplex	Wilcot, J.S.
Juncus lamprocarpus	Stitchcomb, J.S. & F.E.T.
Carex vulpina...	Huish, F.E.T.
C. paniculata	Canal Banks ; Poulton, J.S.
C. pendula	Bicknoll, J.B.G.
C. hirta	Woodborough, J.S. ; Huish ; Wilcot, J.S. & F.E.T. ; Poulton, J.S. ; Elcott Mill ; Mildenhall.
Catabrosa aquatica	Woodborough, J.S.
Festuca sciuriodes...	Between Woodborough and Pewsey, J.S.
F. arundinacea	Huish ; Axford.
Serrafalcus secalinus	Mildenhall.
S. racemosus	Mildenhall ; Overton, J.S. ; Wilcot.

NEW SPECIES.

Ranunculus pseudo-fluitans ...	Canal near Savernake.
Nuphar lutea	Canal near Great Bedwyn, J.S.
Papaver Rhœas, var. Strigosum	Poulton, F.E.T.
[P. somniferum	Railway Bank, Marlborough, F.E.T. ; Manton, G.T.P.C.]
Thlaspi arvense	Pewsey, J.S. ; Woodborough, J.S., F.E.T.
[Cheiranthus Cheiri	Railway Bank, J.S. This is the only specimen hitherto observed which can be called at all wild near Marlborough.]
[Alyssum incanum	Near the Reservoir, Crofton, in a clover field, G.W.D.L.]

Linum usitatissimum	Mildenhall, Mrs. Thompson.
Trifolium hybridum	Wilcot.
Lathyrus Aphaca	Road between Chisbury and Bedwyn, J.S.
Rosa tomentosa	(not R. micrantha, as formerly recorded), Wood near Bedwyn, J.S.; Chisbury, J.S.; Rainscomb, J.S.
R. rubiginosa	White Horse Down, J.M.L.D.
Dipsacus pilosus	Young plants, apparently of this species, were found by J.B.G., at Bicknoll.
Hieracium murorum	Bedwyn Brails, F.E.T.
Onopordum acanthium	New Mill, J.S.
Senecio erucifolius	Bedwyn, F.E.T.
Veronica Scutellata	Axford, F.E.T.; Elcott Mill, W.M.
Mentha Sativa	Between Savernake and Bedwyn, G.W.D.L.
Alnus glutinosa	Bicknoll, J.S. & F.E.T.; Woodborough, J.S.; New Mill, J.S.
Salix purpurea	Mildenhall; Canal bank near Crofton.
Potamogeton pectinatus	Wilton, J.S.
P. compressus	Wilton, J.S.
Lemna polyrrhiza	Wilton, J.S.
L. gibba	Pond at Milton, J.S. & F.E.T.
Juncus diffusus	Wilcot, J.S.
J. obtusiflorus	Wilcot, J.S. & F.E.T.
Carex remota	Great Bedwyn, F.E.T.
C. ampullacea	Huish.
C. intermedia	Axford; Woodborough, J.S.; Elcott Mill.
Equisetum maximum	Bicknoll, J.B.G.

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